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DEPARTMENT OF COMMERCE
BUREAU OF STANDARDS
S. W. STRATTON, DIRECTOR

Weights and Measures

Eighth Annual Conference

OF REPRESENTATIVES FROM VARIOUS STATES
HELD AT THE BUREAU OF STANDARDS
WASHINGTON, D. C., MAY 14, 15, 16, AND 17, 1913

WASHINGTON
GOVERNMENT PRINTING OFFICE
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Dr. W. F. Hand, State Chemist, Agricultural and Mechanical College, Agricultural College, Miss.

LIST OF PERSONS WHO ATTENDED THE CONFERENCE.

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Connecticut	T. F. Egan, State Superintendent of Weights and Measures, Hartford.
District Columbia	W. C. Haskell, Superintendent of Weights, Measures, and Markets, Washington.
Delaware	Chas. L. Penny, State Chemist, Newark.
Idaho	J. H. Wallis, State Sealer of Weights and Measures, Boise.
Illinois	L. G. Metcalf, Illiopolis.
Indiana	J. T. Willett, Chief State Inspector of Weights and Measures, South Bend.
Massachusetts	A. S. K. Clark, Acting State Commissioner of Weights and Measures, Boston.
	J. J. Cummings, State Inspector of Weights and Measures, Boston.
Maryland	G. A. Donoghue, Chief Inspector of Weights and Measures, Baltimore.
Minnesota	C. C. Neale, State Commissioner of Weights and Measures, St. Paul.
	W. E. Thompson, Executive Officer, State Railroad and Warehouse Commission, St. Paul.
	R. W. Smith, Deputy State Commissioner of Weights and Measures, St. Paul.
Mississippi	W. F. Hand, State Chemist, Agricultural College.
Montana	A. M. Alderson, Secretary of State, Helena.
New Jersey	W. L. Waldron, State Superintendent of Weights and Measures, Trenton.
New Mexico	W. A. Bayer, Secretary to Senator T. B. Catron, Washington, D. C.
New Mexico	L. P. Martinez, Secretary to Hon. H. B. Fergusson, House of Representatives, Washington, D. C.
New York	C. E. Keach, Troy.
Ohio	S. E. Strode, State Sealer of Weights and Measures, Columbus.
	F. C. Albrecht, Chief State Inspector of Weights and Measures, Columbus.
Pennsylvania	Henry Houck, Secretary of Internal Affairs, Harrisburg.
	J. Sweeney, Chief of the State Bureau of Standards, Harrisburg.
Rhode Island	W. F. Goodwin, State Sealer of Weights and Measures, Providence.
Tennessee	T. F. Mahoney, Sealer of Weights and Measures, Chattanooga.
Vermont	H. H. Henry, State Commissioner of Weights and Measures, Chester.
Virginia	John W. Richardson, State Superintendent of Weights and Measures, Richmond.
Washington	I. M. Howell, Secretary of State, Olympia.
West Virginia	S. B. Montgomery, Kingwood.
	B. F. Nern, Parkersburg.
Wisconsin	F. P. Downing, Chief State Inspector of Weights and Measures, Madison.

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Baltimore, Md.....G. A. Donoghue, Chief Inspector of Weights and Measures.
John Brendel, Inspector of Weights and Measures.
John A. Harffnor, Inspector of Weights and Measures.
Joseph Lynch, Sealer of Weights and Measures.
Charles Volk, Inspector of Weights and Measures.
Charles J. Silverson, Inspector of Weights and Measures.
J. J. Lanshan, Comptroller's Department.
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W. F. Cluett, Chief Deputy Inspector of Weights and Measures.
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Elizabeth, N. J.....W. J. Bender, Superintendent of Weights and Measures.
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Indianapolis, Ind....I. Wulfson, Inspector of Weights and Measures.
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Hartford County, Conn.....H. K. Young, Sealer of Weights and Measures, Hartford.
Union County, N. J..A. W. Schwartz, Superintendent of Weights and Measures, Elizabeth.
Washington County, Pa.....O. E. Mikesell, Sealer of Weights and Measures.

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D. T. Ackerly.....Wholesale Grocers' Association.
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A. H. Beckmann....Secretary, National Wholesale Grocers' Association, New York City.
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C. F. Shupp.....Winters-Coleman Scale Co., Springfield, Ohio.
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G. I. Waterhouse..Norfolk & Western R. R., Roanoke, Va.
A. G. Zeibel.....Chicago Great Western R. R., Oelwein, Iowa.

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REPORT OF THE EIGHTH ANNUAL CONFERENCE ON WEIGHTS AND MEASURES OF THE UNITED STATES.

HELD AT THE BUREAU OF STANDARDS.

WASHINGTON, D. C., MAY 14–17, 1913.

FIRST SESSION (MORNING OF WEDNESDAY, MAY 14, 1913).

The conference was called to order at 10.30 a. m. by the chairman, Dr. S. W. Stratton, Director of the Bureau of Standards.

The CHAIRMAN. This is quite a contrast from the first meeting of seven or eight years ago, when I think we had only half a dozen here. It may be interesting to you to know that this is the first time that we have used this room, in order to have one large enough for the conference. A great many delegates have not yet arrived. We might accommodate those now here in the old lecture room, but we feel that before the conference is over this will not be too large.

The newcomers from various parts of the country can hardly appreciate the efforts and the drudgery which all of us have gone through in getting this movement started throughout the country and getting people interested; but it has grown and is growing in a geometrical rather than an arithmetrical ratio, and interest is being taken everywhere. The bureau has been exceedingly fortunate in its administrative officers from the very beginning. Even in the Treasury Department the Secretaries of the Treasury were always interested in our work and did everything they could to promote it. The Secretaries we have had in the Department of Commerce and Labor, and especially the last one, whom we all knew very well, and who always greeted us and had kind words to say, were always ready to assist us in every way possible. But when the change came, and it was announced that we were to have a new Secretary who was a manufacturer and who had been interested in the questions of public welfare, we were exceedingly delighted; and again, when it was announced that our Assistant Secretary, who was, formerly mayor of the city of Grand Rapids, was also a manufacturer, we knew we were exceedingly fortunate. I am not going to take your time, because I want you to meet the Secretary and the Assistant Secretary, and I want to say to you that from my own experience with these gentlemen I know that we are going to have all the assistance we can possibly have in this movement so far as our administrative officers are concerned.

I take great pleasure in introducing to you Secretary Redfield.

ADDRESS OF WELCOME BY HON. WILLIAM C. REDFIELD, SECRETARY OF COMMERCE.

Dr. Stratton and gentlemen, it is a great satisfaction to me that this new building, and this new room in it, should be for the first time used for you; and there are special reasons—not merely reasons of courtesy, though I admit the force of the reasons of courtesy—why that is so, which I trust to make clear in a few moments.

One of the things in which I take a little pride and which has never been spoken in public, is the fact that at the second, if it was not the first—I am not quite sure—of the meetings of the Cabinet under the present administration, it was understood without a dissenting voice among the gentlemen present, that the scientific work of the Government was to have the cordial and sympathetic support of the administration from the beginning; and I will ask any of you who have found any changes made in the scientific positions of the Government to call attention to it. So far as I know, there have been none; so far as it lies in my power, there shall be none for any political reason. I would like to have it clearly known and emphasized that the administration believes in, sympathizes with, and desires to assist and enlarge the scientific work of the Government, and that without reserve.

There are three reasons why it is a pleasure to welcome you here. The first is a personal reason. We all feel complimented—and as head of the Department of Commerce I feel especially complimented—that so many of you should have come so far for the purpose of being here. You would not have come unless you thought it was worth while to come, and in the sense that is in your minds that it is worth while to be here lies a compliment to us, to Dr. Stratton, and to his able assistants, that he appreciates, and which I on his part appreciate, and for which I thank you.

So you are personally welcome—by him, by those who labor with him, and by me. But that is not all. You are officially welcome. If I had to describe this institution in a novel, I think I should call it "The House of Accuracy," and should say that in it men strove for truth. Now, truth is a coy damsel. She hides away in the recesses of her own fastnesses, and only discloses herself to those who are patient and painstaking. Here in this institution men work hours, days, months, and years to uncover and to discover truth. But truth when she is discovered has not yet begun to do her work. She is merely found out. The place where she hides has been seen; she may be brought out into the light, but she is not yet translated into terms of usefulness. Her energy has not been translated into units of work. And you are officially welcome here because you are a means of translation of truth into work. The facts which are here found, the light which is here turned upon nature in her many phases, needs translators, needs conductors, needs those who will take it from its source and put it to practical effect. And you are welcome officially here because you are the means of doing that which otherwise could not be done. You are quite as necessary in your sphere to the work of the Bureau of Standards as the work of the Bureau of Standards tries to be helpful to you in your sphere.

It is a case of pulling together, not of working separately; and I rejoice, as an official, that this great public institution finds an outlet into practical doing for its work of introspection, through your able hands.

Now, having exhausted, you will say, the personal and official side, I think you may wonder why it is you are still in a third sense welcome; and yet the third sense, gentlemen, is the greatest of all, and without it the other two would be feeble indeed. You are welcome here socially. Not merely as men, not merely as officers, but because the work by which you are transforming our labors into effect in your own official duties is a work that is good for the common weal. Very candidly, this institution would be useless if it discovered useless truth. Very candidly, you would be useless if your posts were purely sinecures. It is when the truth here found is translated into action of such kind as to lift men up and make life better that the thing becomes finely worth doing.

Over in the old town of Dedham, in Massachusetts, is a very ancient society. It is called the Society for the Apprehension of Horse Thieves. It still exists. It was founded in colonial days, and an acquaintance of mine joined it a few weeks ago. I said to Dr. Stratton that your convention here was a sort of "anticrook society"—that you were here to put a block in the way of men who would do wrong. And I like it the better because the particular kind of crook whom you and we would together aim to block is he who calmly plays his tricks upon those who otherwise could not help themselves.

So this great building, supported so cordially by Congress and by the Executive, and your work and thoughtfulness, coming as far as you do, translate themselves down to this—that Jim's or John's wife, when she goes to market, gets what she pays for. That is infinitely worth doing, and it is the valuable thing for which this institution stands—that through its science and its efforts, and through your cooperation with it, there should come into the life of the common man the "square deal."

REMARKS BY HON. EDWIN F. SWEET, ASSISTANT SECRETARY OF COMMERCE.

I have been very much pleased to see how you have accepted the ideas advanced by the Secretary of our department. It is hardly necessary for me to say that all along the line, in every one of the nine bureaus of this department, we are very proud of our Secretary. We know that he has a good record. We know that he stands well throughout the country, and that he is admirably adapted to the needs of the great Department of Commerce. I am inclined to think that among all the good acts thus far performed by President Wilson, the appointment of Secretary Redfield and Secretary Wilson, of the Departments of Commerce and of Labor, has been looked upon by those who know the men and know the needs of the places as peculiarly fitting. Having served with both of these gentlemen in the Sixty-second Congress and known them as colleagues and known

where they stood on public questions, I feel that in spite of the blushes of the Secretary I can say with all sincerity, and in this temple dedicated to truth, that that is the truth pure and unadulterated.

I have mentioned the fact that there are nine bureaus in our Department of Commerce. It is comparatively new. As the Department of Commerce it is absolutely new—this is its first year—but as Commerce and Labor it is only 10 years old. The people of the United States do not realize what an investment they have in this great department, and I simply want to call your attention to the fact that of the nine bureaus five of them have direct bearing upon the saving of human life. Now, the Secretary has referred to John's wife going to market and getting a square deal, and every one of us says "Amen." But human life counts for more than dollars. Of these five bureaus the Bureau of Standards is one, with its investigations as to the strength of building materials that go into structures of all kinds—bridges and everything else—with its investigations of the heat-resisting power of building materials, and many other matters which I will not consider in detail. Contemplate our lighthouses. Perhaps some of you are not familiar with all these things that we are doing; but the lighthouse system of the whole United States is under one of our bureaus, and is one of those directly bearing upon the saving of human life. Then, in addition to that we have the Bureau of Navigation, involving the enforcement of all the navigation laws, the carrying of proper appliances for the saving of human life, the lights required upon ships, and the observance of navigation rules. An allied field is the inspection of the hulls of boats, and the boilers, etc., all of these things bearing directly upon the saving of human life. Then we have, in addition to the foregoing, the great Bureau of Foreign and Domestic Commerce, which in its full development means the reaching out from our own country and the grasping of business from the whole wide world.

I simply want to remind you of these activities and to ask you to go out as missionaries, telling the people in your localities about the great Department of Commerce. Posting yourselves as far as possible, not only upon what we are doing but upon how to get the benefit yourselves. Consider how your neighbors may get the benefit of what we are doing, for instance, in the Bureau of Corporations, or in the Bureau of Foreign and Domestic Commerce, by getting the reports from our consuls all over the world, learning what foreign countries need, finding how to pack the goods that go to foreign countries, ascertaining, in a word, how to avail yourselves of the investment that you are making in this great Department of Commerce.

Then let me call your attention to this: Night before last the Secretary and I both attended—and Dr. Stratton also, and many others, perhaps, who are here—the peace banquet. It occurred to me at that banquet in the interest of peace, with the idea in mind that we are considering now the matter of universal arbitration, celebrating the peace of a hundred years with England, that the work of our department in trying to get the manufacturers and the

business people of our country to reach out and do business with other countries, and supply their needs, we are doing more than putting dollars into our own pockets. We are getting rid of the need of warships, and we are doing more, perhaps, by thus building up a better acquaintance and a better sentiment and exacting a mutual reliance of nations upon one another, to promote peace than can be done by all the banquets and all the "hot air" in the universe.

REMARKS BY THE PRESIDENT, HON. S. W. STRATTON, DIRECTOR BUREAU OF STANDARDS.

I notice that the president is down for a few remarks. I will simply say that the Secretary has said, in the main, what I wanted to say. For the sake of the new delegates, I would emphasize the fact that I have pointed out heretofore, and that is that we look upon this conference as quite as much for our own good as for your good. As the Secretary as said, the things that we work out here are of no use unless they are brought to the public, and on the other hand the people who are in the field, who are on the ground, working out the practical problems, come in contact with many things that we do not come in contact with at the bureau.

In the original conception of the conference all of us had in mind more such a meeting as this will be, according to our programs, than those which have preceded this one. The original plan was for a conference of delegates exchanging ideas with one another, to which the Bureau of Standards would contribute such technical points as it might have worked out during the year. We hope that this meeting will be one of this kind. We soon found, however, that it was necessary to do considerable pioneer work before we could reach this stage. It was necessary to do a lot of missionary work. One of the first plans we put into effect was to secure from Congress an appropriation for the purpose of making a weights and measures investigation. It had in view two objects, one the making of our own men familiar with conditions, and the other and main object was to make the people themselves in a certain number of the principal cities familiar with their own conditions.

This investigation was productive of very great and useful results. It was carried on by the weights and measures division, under Mr. Fischer, and was successful largely through the efforts of Mr. F. S. Holbrook, of the bureau, who is to present a paper on legislation during the past year later in the conference.

REPORT OF THE SECRETARY, MR. L. A. FISCHER, CHIEF, DIVISION OF WEIGHTS AND MEASURES, BUREAU OF STANDARDS.

To the members of the National Conference on Weights and Measures:

Your secretary, not having any funds to account for, his report will deal with such matters as are of general interest to the conference, and is intended as a survey or recital of what has been done throughout the country in weights and measures by the Federal Government and by the States during the past year.

I am very happy to state that since our last meeting Congress has for almost the first time in its history enacted weights and measures legislation.

The first bill to be passed was "An act to establish a standard barrel and standard grades for apples when packed in barrels," which was approved August 3, 1912. This act provides for a penalty of $1 and costs for each barrel sold under the provisions of the act if the apples contained in the barrel are not of the standard size, quality, and variety marked on the label, or if the label indicates that the barrel is a standard barrel and its capacity is less than the capacity prescribed by the act. This act does not prevent the shipment in interstate commerce of either inferior apples or of apples packed in short barrels if they are not marked so as to bring them under the law. It merely provides that if apples are sold and marked to conform with the regulations of the act that they must be packed in the standard barrel and be of specified quality and size.

The law did not go into effect until July 1, 1913, and as to its value little can be said at this time. It is expected by the sponsors of it, the International Apple Shippers' Association, that apples marked and packed in accordance with the act would be in such demand that ultimately all apple growers would be compelled to ship under the act.

Another act of far-reaching importance is the amendment to the food and drugs act, which requires that all food put up in package form must have the net contents plainly and conspicuously marked on the outside of the package in terms of weight, measure, or numerical count, provided that reasonable variations shall be permitted and tolerances and exemptions as to small packages shall be established by rules and regulations made by the Secretary of the Treasury, the Secretary of Agriculture, and the Secretary of Commerce.

A board representing the three Secretaries is at present engaged in drawing up the rules and regulations for the enforcement of this act and has already held one hearing and proposes to have other hearings in New York about the middle of June.

According to the law the Bureau of Standards, through the Secretary of Commerce, will merely have a voice in drawing up rules and regulations for the enforcement of this particular part of the food and drugs act, the act as a whole being enforced by the Bureau of Chemistry of the Department of Agriculture

This law applies only to commodities shipped from one State to another and does not apply to articles made and sold within the State. To take care of intrastate commerce in package goods, the States should adopt laws and regulations similar to the National Government, although practically all foods put up in package form are made in one State and shipped to all parts of the country, and thus come within the national law.

The net-weight amendment to the food and drugs act was indorsed by this conference last year, and I believe that its passage was entirely due to the activity of the States in passing weights and measures laws requiring the contents to be stated on the outside of packages. The manufacturers who have been opposed to such a law in

the past realized that it was the case of either being regulated by 48 States or being regulated by the Federal Government, and wisely chose the latter.

A recent decision of the Supreme Court of the United States as to the right of a State to establish rules and regulations in conflict with those established by the Federal Government will no doubt be of great interest to the members of the conference.

The case in substance is that "Karo Corn Sirup," labeled "10 per cent cane sirup, 90 per cent corn sirup" in accordance with the requirements of the Federal food and drugs act, was sold in Wisconsin in conflict with the laws of that State, which require that such mixtures containing glucose in a proportion exceeding 75 per cent by weight shall be labeled and sold as "Glucose flavored with maple sirup," "Glucose flavored with sugar-cane sirup," etc., as the case may be; and it was contended by the State that the mixture in question should have been branded with the words "Glucose flavored with refiner's sirup."

Quoting from the decision of the Supreme Court referred to:

It is insisted that the Federal food and drugs act passed under the authority of the Constitution has taken possession of this field of regulation and that the State act is a wrongful interference with the exclusive power of Congress over interstate commerce, in which, it appears the goods in question were shipped. The case presents, among other questions, the constitutional question whether the State act in permitting the sale of this article only when labeled according to the State law is open to the objection just indicated.

That Congress has ample power in this connection is no longer open to question. That body has the right not only to pass laws which shall regulate legitimate commerce among the States and with foreign nations, but has full power to keep the channels of such commerce free from the transportation of illicit or harmful articles, to make such as are injurious to the public health outlaws of such commerce and to bar them from the facilities and privileges thereof. Congress may itself determine the means appropriate to this purpose, and so long as they do no violence to other provisions of the Constitution it is itself the judge of the means to be employed in exercising the powers conferred upon it in this respect.

The question as to what is meant by the word "package" in the food and drugs act is passed upon in this same decision in the following language:

That the word "package" or its equivalent expression, as used by Congress in sections 7 and 8 [of the food and drugs act] in defining what shall constitute adulteration and what shall constitute misbranding within the meaning of the act, clearly refers to the immediate container of the article which is intended for consumption by the public, there can be no question. And it is sufficient, for the decision of these cases, that we consider the extent of the word package as thus used only, and we therefore have no occasion, and do not attempt, to decide what Congress included in the terms "original unbroken package" as used in the second and tenth sections and "unbroken package" in the third section. Within the limitations of its right to regulate interstate commerce, Congress manifestly is aiming at the contents of the package as it shall reach the consumer, for whose protection the act was primarily passed, and it is the branding upon the package which contains the article intended for consumption itself which is the subject matter of regulation. Limiting the requirements of the act as to adulteration and misbranding the packages intended to be purchased by the consumer, so that the importer, by removing and destroying such covering, could prevent the operation of the law on the imported article yet unsold, would render the act nugatory and its provisions wholly inadequate to accomplish the purposes for which it was passed.

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The object of the statute is to prevent the misuse of the facilities of interstate commerce in conveying to and placing before the consumer misbranded and adulterated articles of medicine or food, and in order that its protection may be afforded to those who are intended to receive its benefits the brands regulated must be upon the packages intended to reach the purchaser. This is the only practical or sensible construction of the act, and, for the reasons we have stated, we think the requirements of the act as so construed clearly within the powers of Congress over the facilities of interstate commerce, and such has been the construction generally placed upon the act by the Federal courts.

The court further states that—

While these regulations are within the power of Congress, it by no means follows that the State is not permitted to make regulations, with a view to the protection of its people against fraud or imposition. * * *. It is equally well settled that the State may not, under the guise of exercising its police power or otherwise, impose burdens upon or discriminate against interstate commerce, nor may it enact legislation in conflict with the statutes of Congress passed for the regulation of the subject, and if it does, to the extent that the State law interferes with or frustrates the operation of the act of Congress, its provisions must yield to the superior Federal power given to Congress by the Constitution.

This decision, in substance, is that the States can not adopt regulations which are in conflict with those made or adopted under the authority of Congress.

A bill of considerable interest to members of this conference is one introduced in the last session of Congress by Hon. William E. Tuttle, of New Jersey which, after being favorably reported to the House of Representatives by the Committee on Coinage, Weights, and Measures, failed of passage. This bill sought to establish a standard barrel for all dry commodities and to prescribe a penalty for the use of any other barrel for such commodities. It was framed upon the assumption that Congress, under the authority given to it by the Constitution to fix the standard of weight and measure, had the authority to prescribe what a standard barrel should be and to enforce its use. This bill also provided for the half barrel and made it a misdemeanor to sell any dry commodities in and as a barrel unless it was of the standard prescribed in the law, which was the same as the dimensions prescribed in the act establishing the barrel for apples already referred to.

Objection to this bill was made by the cranberry interests on the grounds that the barrel prescribed in the act was not suitable for shipping cranberries, and that the dimensions of the barrel which they were using had been fixed by several States. There was also objection on the part of others on the ground that the act did not permit the use of other size barrels, provided the capacity was marked on the outside.

In connection with this last-mentioned objection it occurs to me that the way to establish a standard barrel is to establish it, and not permit any other containers of whatever dimensions to be called a barrel. To permit any container to be sold as a barrel merely because the capacity was marked on the outside would be as logical as to permit any size measure to be called a bushel provided the capacity was marked on the outside, or to call any quantity of coal a ton provided the true weight were given. A law which would permit the use of barrels of any size capacity, provided the said capacity is

marked on the outside, would be virtually legalizing short measure and would result in confusion rather than protection to those purchasing by the barrel. If an individual were to purchase a barrel, he would be compelled to ascertain its contents and compare its volume with the standard in order to find out how much he was paying per barrel. Or, if a merchant were to purchase, say, 100 barrels he would be compelled to note the contents, add them all up, and divide by the capacity of the standard barrel before he would know how many barrels he had.

Mr. Tuttle has reintroduced his bill in the present Congress, and hopes that as soon as Congress has appointed its committees that hearings will be arranged by the committee.

Another matter of interest to the members and which requires some explanation is the question of post-office scales. Like all other weights and measures the inspection of these scales has been neglected although the attention of the department has more than once been called to the fact that many of the scales were not in good condition.

The recent purchase of a large number of scales for the use of the Parcel Post Service, which proved to be unsatisfactory, has brought down upon the department the criticisms of a number of the local sealers. While little excuse can be offered for the use of faulty scales by any branch of the Government, the conditions which prevailed at the time scales for the parcel post were purchased were peculiar and should be considered. Congress did not pass the parcel-post law until the latter part of August, and yet it provided that the law should go into effect on January 1. Naturally, it was not until some time in October or November that the question of the necessary equipment was decided upon and manufacturers were requested to submit samples of their product. According to the law the weight of a package which could be sent by parcel post was limited to 11 pounds, but in order to allow for a possible increase in the weight at some future time it was deemed advisable by the Post Office Department to secure scales of at least 20 pounds capacity. No scale suitable for parcel-post purposes was on the market, and the principal manufacturers who submitted samples based them upon the old type of the old post-office pattern. No other types were submitted, and the department was compelled to either accept these or to delay the enforcement of the law. From many points of view this might have been a good thing to do, but it is, I think, obvious to everyone that there would have been very great objection to this on the part of the public. In addition, the outgoing administration was naturally anxious to inaugurate the Parcel Post System, which was largely due to the activity of Postmaster General Hitchcock.

An investigation of the complaints of shippers as to railroad weights by the Interstate Commerce Commission, begun about a year ago, has drawn attention to the desirability of some supervision of railroad-track scales. In order to secure information that would enable the Government to draw reliable conclusions as to what shall be done to guarantee the accuracy of railroad weights, and also for the purpose of aiding the railroads to install correct scales, the Bureau of Standards secured an appropriation of $25,000 for the purchase of a test-

weight car equipment. The contract for this car has already been let, and it is expected that soon after July 1, when the appropriation becomes available, that the inspection of some of the scales on the eastern railroads will begin.

The equipment ordered by the bureau will differ radically in principle from any in use. Instead of the wheels, brakes, and other movable parts of the car constituting part of the standard weight as is customary, the bureau proposes to carry a series of 10,000-pound weights and a truck for moving them on the scales, in a specially designed car provided with a power crane and other accessories for handling the weights. The advantages of this arrangement is that the weights may be standardized and transported from one end of the country to the other with a reasonable assurance that they will remain constant, whereas, if the running gear is included in the weight of the test car it would be necessary to verify this weight at frequent intervals.

After testing a scale with the standard weights the empty car may then be put on the scale and its weight determined, after which the weights may be loaded into the car and the scale tested up to the full capacity of the car plus the standard weights.

We hope at the next conference to have this car on exhibition, and also to give you some results obtained with it.

The activity in the States reported on at the last meeting has been continued this year, the following-named States having passed laws on the subject of weights and measures: Arizona, California, Connecticut, Idaho, Indiana, Iowa, Kansas, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, Ohio, Oregon, Pennsylvania, South Carolina, Vermont, Virginia, and Washington. Quite a number of other States considered bills, and the prospects are encouraging for considerable progress at the next legislative sessions. The nature of this legislation will be reported upon in detail by Mr. Holbrook.

A great deal of work has been done in connection with the calling of the present conference, and efforts have been made to get as many sealers to attend as possible. The main reason that has deterred delegates from attending this and other conferences is the lack of funds to pay their expenses. To get a delegate appointed is quite a simple matter compared with that of getting him to attend when there are no funds to pay his expenses. In order to have some provision made to defray expenses of State delegates, letters were prepared in January of this year to the governors of those States holding sessions in 1913 and which were not usually represented at the conference, urging upon them the advisability of securing an appropriation for this purpose. Some little success was had in this direction, but it is a matter which needs to be followed up year after year until all the States come into line.

Over 2,000 letters and 1,400 announcements were sent out, and sorely taxed the force available for the weights and measures work.

A special attempt was made this year to induce manufacturers of all weighing and measuring apparatus to make an exhibit, and

the collection in the other end of the building, which has been installed at considerable expense to the manufacturers, is by far the best we have ever had.

On the whole, I believe that those of us who are interested in the subject of weights and measures have every reason to feel satisfied with the progress that is being made. When you consider that less than eight years ago there was practically no interest taken in the subject whatever and that the laws on the statute books were almost without exception obsolete and inefficient, and further that there was no attempt being made to enforce them, we have every reason to feel encouraged by this splendid gathering of weights and measures officials from all parts of the United States. I have no doubt that this conference, which is the largest and most important we have ever had, will make its influence felt and that further progress will be reported at our next meeting.

REPORT ON WEIGHTS AND MEASURES LEGISLATION ENACTED IN THE UNITED STATES DURING THE YEAR.

By F. S. Holbrook, *Associate Physicist, Bureau of Standards.*

Mr. Chairman and gentlemen, at the last Conference on the Weights and Measures of the United States it devolved upon me to report on the legislation which had been passed by the various States in relation to the subject of weights and measures during the preceding session of their legislatures. It seemed that it would be a matter of interest to the present conference to report on the legislation which has been passed from that time to the present in order to bring the matter up to date. I have therefore undertaken the preparation of such a report. This summary will include legislation passed last year subsequent to the date of the former report and that legislation which has been placed upon the statute books up to the present time this year. This may not include all the legislation to be expected before the various legislatures adjourn, since a number of them are still in session. It may be also that some minor bills already passed have not come to our attention, but an endeavor has been made to cover the entire field as completely and accurately as is possible.

As in the report presented last year, we will make but little attempt to point out what we believe to be the strong or weak points of the laws except in a few special cases. If the matter be of sufficient interest, the delegates representing the States enacting the legislation will undoubtedly mention the nature of the provisions and they will be able to talk upon the matter with a more intimate knowledge than I could hope to have.

First, then, as to national legislation. Since the meeting of the conference held last February, Congress has passed two statutes relating to weights and measures, which are of the greatest interest and importance to all officials enforcing weights and measures laws. No detailed notice need be given these acts, however, since they have already been explained by Mr. Fischer in his report.

The second general division of the report is now to be considered, i. e., legislation by the States. In the following discussion the States

are arranged in alphabetical order. We have, then, to consider the following:

Arizona has passed a law on the subject of weights and measures, general in its terms and based directly upon the model law recommended by this conference, many of these sections having been enacted without material change. The system adopted requires the appointment of city sealers in all cities of more than 5,000 population under the usual supervision of the State inspector. In cities of less than 5,000 and more than 1,000 population the work of inspection is to be done directly by the State inspector. Communities of less than 1,000 people do not seem to have been provided for in this law. In addition to these requirements there are provisions requiring most package goods to be marked with the net weight of the contents, regulating the sale of wood, ice, hay, fresh meats, butter, etc. Later in the year the State broadened the scope of this law by providing specifically that the testing of water, gas, and electric meters should be in charge of the city sealers and the State inspector of weights and measures.

The most unsatisfactory feature of the legislation is that requiring fees to be collected from those for whom inspections are made. This provision has been discussed at such length in the past that it seems that nothing need be added at the present time regarding the undesirability of this feature of the legislation.

The gallon of 282 cubic inches for ale and beer should not have been established as a standard, since this measure is not recognized by the United States Government nor by the very great majority of the States. Neither should the yard standard have been described as "identical with the imperial yard of Great Britain."

California has passed a new weights and measures law under the authority granted by paragraph 14, Article XI, of the constitution of the State, as amended in 1911. The new law provides for a system of inspection which it was heretofore impossible to establish on account of constitutional prohibitions, and is a very excellent one. A State superintendent of weights and measures and one or more deputies are provided for who are given powers and duties similar to those recommended in the model law adopted by the national conference. Each of the counties of the State must appoint a sealer of weights and measures or, if they do not desire to do so, they must apply to the State superintendent for the assignment of a State deputy superintendent to perform the acts required by law in the entire territorial limits of the county, except in cities and towns in which sealers have been appointed pursuant to law. And every city, town, or city and county may appoint a sealer. Thus, a State-wide inspection of weights and measures in commercial use is absolutely provided for. The powers and duties of these officials are similar to those suggested in the model law and are very satisfactory. Penalties are provided for keeping or using false or unsealed apparatus or selling the same when sealing is possible before sale, disposing of condemned apparatus, selling or offering for sale less than the quantity represented, etc. Other sections provide for satisfactory standards. As mentioned above, the whole bill is a most excellent one.

Connecticut amended several sections of its weights and measures law, but the amendments are not of very general interest.

Idaho passed a law in relation to this matter at the recent session of the legislature. This act establishes the customary standards and materially enlarges the powers and duties of the State sealer of weights and measures who, by a former act, is the dairy, food, and sanitary inspector of the State. The present act makes it mandatory for the State sealer to test and seal or condemn all apparatus used in the State. Cities and municipalities are given the power to appoint sealers and pass ordinances not in conflict with the laws of the State. The remainder of the act specifies the manner of sale of various commodities. Thus, a large number of dry commodities for which a legal weight is specified must be sold only by weight; berries and small fruits, when sold in boxes, must be sold only in those containing a standard dry quart or dry pint unless information that the boxes hold less than this amount is given to the purchaser and a statement of the net contents labeled on the box; milk and cream must be sold in standard-size bottles; pails of lard must be labeled with the net weight; prints of butter containing less than 16 ounces must be labeled with the weight; and bread must be sold by weight. A new penalty section is also enacted.

Indiana introduced a bill to amend the law passed in 1911 and, after much debate and some amendments, it was finally enacted into law. One of the principal objects of the bill was to make it mandatory on the counties to appoint sealers of weights and measures, the original law merely being permissive in its terms. The bill, as originally introduced, required all counties with over 20,000 population and all cities of the first and second classes with over 20,000 population to appoint such officials. As finally passed, however, the only counties required to appoint sealers are those of 50,000 or more population which do not contain a city of the first, second, third, or fourth classes already having such an official. As a result of thus increasing the population requirement, the number of new sealers required to be appointed was very materially reduced. There are other features of the bill which are both important and excellent ones; for instance, that putting city sealers under the the municipal civil-service regulations, and that requiring all commodities to be sold by weight, measure, or numerical count rather than in the indefinite manner so common heretofore. The penalty section was also amended.

Iowa has passed a general law which repeals that part of the old law relating to the State department of weights and measures and some other provisions, and enacts substitute sections in their stead, many of which are based upon the provisions of the model law recommended by this conference. This legislation requires the appointment of a State inspector and a State sealer in the department of the dairy and food commissioner. The State sealer is given those powers and duties of our model law which relate to the keeping of the State standards and the testing and sealing of local standards. The chief inspector and his assistants are authorized to test and seal or condemn commercial weights and measures in use in the State. The fee system formerly legalized is abolished except for scales of 2,000

pounds capacity or more. Dry commodities for which a legal weight per bushel has been established may hereafter be sold only by weight in the absence of a special written agreement, and all other dry commodities, weighing 10 ounces or more, may be sold only by standard weight or numerical count, linear measure or surface measure.

The sale of coal, bottled milk, and berries is satisfactorily regulated and penalties are provided for all violations of the provisions of the act. The sections allowing the appointment of local sealers in counties, cities, and towns have not been repealed or amended.

Kansas passed an amendment to chapter 334 of the session laws of 1911, which requires that bales of hay shall be marked and sold by their correct weights.

Louisiana passed a bill relating to the inspection service in the city of New Orleans. The system allowing the city inspectors of weights and measures to keep, as compensation, the fees collected by them in the performance of their duties is abolished, but the fee system itself is retained, the collections now being turned into the city treasury and the two inspectors provided for being salaried men. The powers and duties of the inspectors are enlarged and the inspection system appears to have been put upon a somewhat better basis.

Maine passed one general and two special laws on this subject at the session which recently closed. The general law is in the nature of amendments to the present statutes of the State, and adds a great deal to the strength of these laws. The major portion of the changes are based on sections of the model law recommended by this conference. A berry-box section is also included which requires all boxes for berries holding 1 quart or less to be of the capacities of 1 quart, 1 pint, or one-half pint, standard dry measure. The section specifying the weights per bushel of commodities has been extensively revised. An act relative to sealing milk bottles and jars requires these to be of standard capacities, with the usual tolerance allowance, and contains most of the other provisions of the milk-bottle section of the model law.

Massachusetts made several important additions to the statutes on the subject of weights and measures. In 1912 the list of legal weights per bushel for fruits and vegetables was amended and amplified and it was provided that all fruits and vegetables for which a legal weight was established should be sold only by numerical count or by weight, thus eliminating the use of the dry measure for a very large number of important commodities. At the present session of the legislature a determined effort was made to nullify this law and to reintroduce the old method of selling by measure, a bill being introduced to this effect. This passed the lower house but was defeated in the senate; so the ground gained has not been lost. The second important amendment was the passage of a bill making it unlawful to sell any commodity by any other weight than the net weight of the commodity. It is believed that the sale of commodities by gross weight can be prevented, regardless of any statement to the contrary, under the terms of this law. The abuse of charging retailers and consumers for wooden cores, backsticks, heavy burlap, and paper wrappings, cord, etc., at

the price of the commodity itself, upon the strength of a statement upon the invoice or delivery ticket that the delivery is made "gross weight," may thus be eliminated in this State, by a competent enforcement of this law. Other bills were also enacted requiring the measuring by sworn city or town officials of all leather sold by measure; and the testing and sealing or condemning of all machines used in the measuring of leather. On account of the very large shoe manufacturing industries in this State this subject is of very great importance here.

Michigan enacted legislation at the last session which was based directly on the model law recommended by the conference. Some of the sections were adopted practically intact, while others were amended in important particulars, these amendments in nearly every case, however, tending to weaken the original law. The State dairy and food commissioner is by virtue of his office the State superintendent of weights and measures of the State. His deputy is likewise deputy State superintendent of weights and measures, and all inspectors in the dairy and food department are State inspectors of weights and measures as well. The next important amendment apparently prevents the confiscation and destruction of incorrect apparatus. The provision that counties and cities appoint sealers of weights and measures is not mandatory, but they may do so "in their discretion."

The penalty section has been weakened by requiring that before conviction it must be proven that short weight or measure has been "knowingly" sold or offered for sale. The difficulty of proving the state of a man's mind, even in flagrant cases of fraud, has been discussed so frequently in the past that it does not seem necessary to comment on this matter at the present time.

Minnesota added several valuable sections to its excellent code of laws. One section relates to the standardization of boxes used in the sale of berries by allowing containers of the capacities of 1 quart, 1 pint, and one-half pint or multiples of a quart standard dry measure only; another provides for better equipment for testing railroad-track scales; another gives the warehouse commission jurisdiction over the track scales used by common carriers and the power to require the installation of the same; it is still further provided that the warehouse commission may compel railroads to furnish scales for free public use in stockyards; and finally, there are general amendments to the weights and measures law of the State.

Montana amended the law passed by that State in 1911 by repealing the entire law and reenacting it with important changes, and it appears that the statute has been greatly strengthened and improved as a result. The county clerks are no longer designated sealers of weights and measures for their respective counties, but instead the State sealer is authorized to create weights and measures districts and appoint weights and measures inspectors therein. The State sealer is given specific jurisdiction over the track scales of the State; a net contents of container section is added to the law, as well as a general net weight provision; and the penalty section has been strengthened. Another very important and excellent change is the

abolition of the fees formerly required to be collected by the State sealer of weights and measures and his deputies for the work performed by them.

Nebraska passed at the present session of its legislature a weights and measures statute which is general in its terms but which fails to provide a mandatory inspection of all weights and measures in commercial use, although it appears that it is possible to obtain this object under the terms of the law. The deputy food, drug, and dairy commissioner is the deputy State sealer and to him and to his assistants is intrusted the State supervision provided for under the act. These officials may test weights and measures, but it does not seem that they are required to do so. Fees are to be collected for the work done by them, these fees to be used in the proper enforcement of the law. No other money is appropriated for this purpose. In the counties the county clerks are designated sealers of weights and measures. They are required to test apparatus only upon request, although they may do testing work at other times if they so desire.

Cities or municipalities are empowered to establish inspection services, but are not required to do so. On the whole, it does not appear that the act is a very satisfactory one, although it may be considered as a forward step in legislation in this State.

New Hampshire during the present session has thus far passed only such laws as are entirely local in their nature, but there appears to be an excellent opportunity for the passage of a general law before the close of the session.

New Jersey has passed several amendments to the excellent law already in force in that State designed to strengthen that law by making it possible to eliminate dealing which, while resulting in false representations and fraud, could not be attacked directly under the former provisions. Perhaps the most important of these changes is that standardizing the size of baskets used in the sale of dry commodities. Formerly all kinds of odd sizes were used, and when these were sold in competition with each other it was very difficult for the purchaser to buy efficiently, since the amount to be obtained could not easily be ascertained. It is now made unlawful to manufacture, use, or offer or expose for sale any other baskets than the standard sizes mentioned in the act, these sizes being 2, 4, 8, 16, 20, and 32 quarts. Enforcement of this law should result in the elimination of fraudulent misrepresentations of quantity and assure the purchaser of the quantity received. Another bill gives the weights and measures officials police powers in connection with their work, and this will assist them very materially in many cases in bringing offenders of the law to justice. The penalty section has been strengthened and the procedure to be followed in the arrest and trial of offenders against the weights and measures statutes has been defined with great particularity. The magistrate shall hear and determine the guilt or innocence of persons summoned, in a summary way, and upon conviction a penalty may be enforced by execution against their goods and bodies without any special order of the court.

New Mexico passed a general law on the subject of weights and measures designed to establish a State-wide inspection of the weights

and measures in commercial use. The law is an inclusive one and evidently endeavors to cover the entire subject. While it has many excellent provisions, the machinery provided for enforcement is very poor and the law also contains many unsatisfactory and indefensible provisions. The legislation is not based on the model law, but does seem to have copied provisions from a number of other States. It may be advisable to mention briefly a few of the sections which we believe are very poor ones.

The only State weights and measures official provided for is the secretary of state, ex officio, and his only duty appears to be the providing and testing of county standards. The sheriffs of the counties are designated county weighmasters, these officials being allowed to appoint deputies to enforce the weights and measures laws. Fees are to be collected for all work done and these fees are to be kept by the officials for their own use, no other compensation for the performance of the duties specified being provided. The only State standards required to be procured and kept are weights of specified sizes, although in a later section "all weights and measures accepted and used by the Government of the United States at the present time, except as herein provided," are standardized. The only commercial apparatus required to be tested and sealed are scales; weights, measures of capacity and length, and measuring apparatus of all kinds are entirely neglected in this connection. All berries sold in boxes must be sold in boxes containing a standard liquid quart or liquid pint, and boxes of all other sizes must be labeled with their net contents. New Mexico has evidently followed the lead of Kansas in this matter, although such a provision is one of the most regrettable ones which could be included in a State law. It will be readily admitted by those familiar with the subject that a law containing such provisions as these is a very poor one.

New York during the present session added one section to its excellent code of laws. This standardizes the dimensions of 4, 8, and 20 pound baskets for use in the sale of grapes, and provides that grape baskets of all other sizes must bear a statement of the net quantity of their contents in terms of weight, measure, or numerical count. The section of the present code of laws relating to the marking of bales of hay and straw was strengthened by an amendment. A bill relating to the testing of all railroad track scales within the State was passed by both houses of the legislature, but failed to become a law on account of a veto by the governor.

Ohio strengthened the law requiring certain fruits and vegetables to be sold exclusively by numerical count or weight, and has thereby made it possible to enforce its provisions competently. In the former law these commodities might be sold only as mentioned above "unless by the agreement of all contracting parties." This phrase made it extremely difficult to obtain convictions even in cases of willful violation of the intent of the law. The amendment requires these special agreements to be in writing and hereafter it would seem to be an easy matter to bring all offenders against the spirit of the law to justice. The section requiring berries and other small fruits to be sold by a bushel or fractional part thereof has been amended to require the

subdivision of the bushel to be an aliquot part thereof. The diameters and depths of dry measures have been standardized. The State sealer has been given the power "to make, publish, and enforce such rules and regulations as may be necessary to the prompt and effective enforcement of the weights and measures laws of this State." A special section requiring the testing of the computing part of computing scales has been added; and finally, the word "knowingly" has been stricken out of the penalty section. All of these amendments seem to be excellent ones and do much to strengthen the weights and measures laws of the State of Ohio.

Oregon has passed one general law at the present session of the legislature which is inclusive in its terms and mandatory in its provisions, and which provides for a State-wide inspection of all weights and measures in commercial use. The State officer is to be appointed by the State treasurer and is entitled the deputy State sealer of weights and measures. He is to exercise a general supervisory control over the inspection of weights and measures in the State, and may make such investigations of trade and trade customs or practices as he deems necessary, and is empowered to appoint such assistant aid necessary to place the provisions of the act in practical operation. Each county is required to appoint a sealer and the cities may do so. These latter officials must seal all apparatus in commercial use at least once in each year, must prosecute violators of the laws, make annual reports to the State sealer, etc. Penalties are provided for using false apparatus, delivering false weight, interfering with the weights and measures officials, etc.

The law relating to the branding of butter sold in rolls, prints, or squares was amended in several particulars. It is now made unlawful to put up any other sizes than 1-pound and 2-pound packages.

Finally, it is made unlawful to subtract any tare for bags used in the sale of wheat, potatoes, and some other specified commodities unless there is a special agreement for the deduction of such tare weight.

The law relating to the inspection of railway-track scales was also amended.

Pennsylvania has passed only local legislation for Philadelphia thus far, and I am not certain that this has been signed by the governor as yet. The legislature is still in session, however, and they may enact a general bill before adjournment, as such a bill is now under consideration.

South Carolina passed legislation fixing a standard weight per bushel for a very large number of dry commodities and also providing for standard barrels for various purposes. It is made unlawful to sell any of the products mentioned "except in strict accordance with the standard weights and measures" so provided, and means of enforcement and penalties for violations are included in the act.

Vermont amended the law enacted in 1910 in several particulars. The State department is given specific jurisdiction over the scales used by common carriers; is empowered to seize, for use as evidence, commodities, packages, and articles offered for sale in a manner contrary to law; and is required to pay particular attention to the weights and measures used in the creameries of the State. The intentional misrepresentation by the buyer of the amount of commodity pur-

chased is made a punishable offense; and the section relating to the legal weights per bushel has been greatly amplified and strengthened.

Virginia has not passed any important legislation on the subject of weights and measures, but in 1912 this State did pass a bill revising the number of pounds per bushel required by law for certain specified commodities.

Washington has enacted legislation providing for a State-wide inspection of the weights and measures in commercial use, this law containing most of the provisions of the model law recommended by this conference. The State inspectors are put in the department of the secretary of state, this official being made ex officio superintendent of weights and measures. The actual work will be taken care of by a deputy superintendent and one inspector. City sealers are required to be appointed in all cities of the first class, while in the counties the auditors are made sealers, ex officio. As in the case of the State, a deputy sealer is required to be appointed in each county, having the same powers as the auditor in respect to this act, and upon these officials will fall the duty of seeing to the enforcement of the law. In addition to the sections taken from the model law, the manner of sale of butter, bread, potatoes in sacks, berries in boxes, coal in sacks, milk and vinegar in bottles, ice, and wood are provided for. In regulating the sale of most of the above articles in packages, standard sizes are specified which do not have to be marked with the net contents; but when any other size than the standard is packed, the net contents in terms of weight or measure must be stated on the outside of the package in plain English words and figures.

An analysis of the above indicates that the Congress of the United States and the legislatures of at least 25 States have enacted some laws in relation to the subject of weights and measures during the year just passed. A number of these statutes are general in their nature, while others are designed to amplify or improve the provisions of laws already in force.

The long fight for a law making it compulsory to label original packages with the net quantity of the commodity contained therein has, in the case of foods at any rate, been brought to a successful conclusion by the passage of this law by the Congress of the United States; and the probability of national legislation on those phases of the general subject of weights and measures, which can be more equitably regulated by the action of the National Government than by the individual accomplishments of each of the 48 States, has been greatly increased by the precedent established by the passage of the Sulzer apple-barrel bill.

A large number of the State laws passed are based, in whole or in part, on the model law adopted and recommended to the States by this conference two years ago. Also a very great majority of the laws are excellent ones, well adapted to improve the condition of the apparatus in commercial use as well as to eliminate fraudulent practices in commercial dealing. Thus, it may well be said that much ground has been gained in the crusade for honest weights and measures and that that uniformity of law so much to be desired, and yet heretofore so little in evidence, is rapidly being attained.

I thank you, gentlemen.

REPORTS OF STATE DELEGATES.

ARIZONA.[1]

By O. N. Creswell, *State Inspector of Weights and Measures.*

Mr. Chairman and gentlemen, I was appointed by the Hon. G. W. P. Hunt, governor of the State of Arizona, as a delegate to the Eighth Annual Conference of State Sealers, but owing to the heavy expense that our department has had by reason of its initial organization it is impossible for me to attend this conference, and I take this means of letting the delegates know what progress the State of Arizona is making on the very important question of weights and measures.

The act creating the office of State inspector and city sealers of weights and measures, defining the powers and duties of such inspector and city sealers, etc., was passed by the first legislature of the State of Arizona, and was approved by the governor on the 28th day of May, 1912. The act is taken from the model law adopted by the sixth annual conference. I wish to say in this connection that the complete and thorough investigation made by the Bureau of Standards in the year 1911 was the cause of the present law being enacted. Further, I wish to add that the weights and measures law was introduced in our legislature by Hon. J. T. Hughes, State senator of Pima County, and the creation of this department and the able provisions of our law are due to the great work and the keen interest of Senator Hughes on this subject.

Our law gives the State inspector general supervision of the city sealers of the State, and also he is required to make inspections in all towns and cities of from 1,000 to 5,000 population. In towns and cities over 5,000 population there are city sealers who are appointed by the common councils of such cities.

Owing to the fact that in Arizona we have the referendum, the law as passed by the legislature did not become operative until August 16, 1912. We were further delayed in securing the State standards and really did not begin to make inspections until January, 1913. Our law is giving general satisfaction throughout the State, and all the cities entitled to have city sealers have organized their departments, with only one exception.

Our legislature is in session at this writing and this office has a bill now pending which will increase the jurisdiction of the State inspector and also broaden the scope of our present law. From indications at this time it is very likely that the bill will become a law at this session.

In addition to the weights and measures provisions of our law, the State inspector and the city sealers are also required to test and inspect all gas, water, and electric meters in their jurisdictions, being in this work under the direction and supervision of the corporation commission.

The people of Arizona are coming to realize the need of a proper supervision of weights and measures, and we feel sure that when our law has been in operation for a period of one year, that the citizens

[1] Submitted by mail.

of this State will appreciate the many advantages of having such legislation.

I wish in this connection to express my sincere thanks to the Bureau of Standards for the great assistance rendered us in the organization of our department, as well as for their initial work of inspection, which really caused our law to be enacted.

I assure you of my sincere regret in not being able to be present at this conference and extend very best wishes for a successful meeting.

CONNECTICUT.

By THOMAS F. EGAN, *State Superintendent of Weights and Measures.*

Mr. President and fellow delegates, many of you will recall that a year ago I reported that our legislature had neglected to make an appropriation for the State bureau sufficient to carry out fully the provisions of the law enacted in 1911. We have, however, done all that we could in our State; that is, our department has encouraged the appointment of county and city sealers. In our State there are eight counties, and there have been five county sealers appointed. In three counties they have delayed making appointments because they were not fully informed or decided as to how the county sealer should be paid. That matter has been taken care of in the present legislature by law, in a very few words, providing that the county sealer's salary shall be paid by the county treasurer on order of the county commissioners.

Our State branch of the weights and measures department has not done a great deal, because of the lack of funds. However, we have had our standards returned from the bureau here, and attended to those of the county and city sealers that were sent to be standardized. The county sealers in five counties have been very active and efficient; also in all the cities where appointment is required, namely, Hartford, New Haven, New Britain, Waterbury, Stamford, Bridgeport, and Meriden.

There is not much that I can say that will be of interest to the delegates assembled here, except that we have at the present time amendments to the law of 1911 which will, I believe, provide the State department with sufficient funds to carry out fully the requirements of the law, and to give encouragement to county and city sealers for a full carrying out of the work contemplated in your model law. There are delegates here from three counties, I believe, in our State, and four cities. They probably would like to be heard from later on, and I should like to hear from them. They are all very active and efficient officials.

DISTRICT OF COLUMBIA.

By W. C. HASKELL, *Superintendent of Weights, Measures, and Markets.*

Mr. President and gentlemen, as many of the delegates are familiar with the laws governing the weights and measures division of the department of weights, measures, and markets for the District of Columbia, I think perhaps a brief outline of the work accomplished will be of interest.

For the past 14 years the District of Columbia has enforced a rigid inspection of the weights and measures and has investigated the manner of sale of all commodities, so that conditions here should be better than in cities where weights and measures laws have more recently been adopted and enforced. Previous to that time, although the laws were operative, the office was without assistants and the necessary equipment for the thorough inspection which should have been made. At the present time we are handicapped because the force is not large enough to take care of the business with the promptness which should be given to requests for inspections and to the investigations of short weight and measure complaints. The officials have had during most of said period the cooperation of the honest dealers and associations interested in having for members only those whose business methods are honest. Honest dealers have nothing to fear from the inspection of weights and measures. Our experience has demonstrated, however, that rigid inspections and the greatest vigilance are necessary on the part of the office to keep some dealers honest and that there will always be this class of dealers willing to take the chance of defrauding for their own gain. It is the purpose of the office to establish, beyond doubt, intent to defraud or gross carelessness before making any arrests for violations of the weights and measures law.

During the spring and summer months the office gives special attention to all dealers in ice, large or small, and while there will always be some unscrupulous dealers who will endeavor to give short weight with close vigilance we hope to decrease the number to a minimum. It is our custom every spring to post notices at the different stations where dealers are supplied with ice, informing the dealers of the date and time the inspectors will be there for the purpose of inspecting and testing scales used on ice wagons. The hours are fixed to suit the convenience of the dealers at the several stations, and they are given the choice of having their scales tested there or of bringing them to the office. After a reasonable time limit those who have failed to respond to the notices and who are found using scales which have not been sealed are arrested for violation of the weights and measures law.

Over 400 wagon scales were inspected during the past year. Where new scales are to be installed, we advise that only a concrete and steel foundation be used, as timber soon decays and allows the scales to settle in places, causing them to get out of level, and a faulty scale is the consequence. Our coal dealers are realizing the necessity for installing scales of modern type and do not now consider the cost of scale or foundation when replacing their old ones, and we are pleased to say that this is being done to a considerable extent, which relieves our responsibility very much. Coal carts are taken up on the streets and coal reweighed by the assistants, and it may interest you to know that of about 60 loads of coal so taken up last year, for verification of weight, only 3 were found short and these were less than 20 pounds each, the loads generally running from 15 to 60 pounds overweight. Most of our trouble is experienced with the peddlers or coal hucksters who sell coal by the bushel. The merchants who are

in regular business are generally honest and anxious to have their scales correct and to sell full weight. The assistant sealers have made several important arrests of drivers who were found stealing coal that they were sent to deliver. It is the practice of the office to watch the carts or wagons from the time they leave the dealers' yard until the place of delivery is reached to prevent the arrest of any dealer for short weight due to theft on the part of a driver.

I will quote the following from our last annual report:

During the fiscal year ended June 30, 1912, there were 22,292 inspections of scales, weights, and measures which were sealed and fees amounting to $6,598.86 were collected; 428 scales and measures were condemned and destroyed; 379 scales condemned for repair; 219 inspections upon request and within the time limit, for which no fees were collected; 390 inspections for the United States Government and 178 for the District of Columbia, a total of 23,886 inspections for the year exclusive of the number of milk bottles and paper ice-cream measures inspected. During the year 23 cases were presented to the police court for prosecution for violation of the weights and measures law, and fines to the amount of $553 imposed, a decrease of 54 in the number of cases presented the preceding year. One iceman was sentenced to 30 days in jail in each of 3 cases, upon his failure to pay a fine of $150 imposed by the court. During the past eight years 506 cases have been prosecuted and the total fines for said period amounted to $6,279.

The general improvement in the condition of the scales, weights, and measures in use in the District of Columbia, and in the decrease in the number of cases presented to the police court for prosecution, indicates that the purchasing public now receives more nearly what it pays for than it ever did.

On the annual inspection of dairies conditions were found to be better than in previous years, manufacturers of milk bottles apparently using care that the bottles for this city should measure up to the standard in capacity. Eighty dairies were visited, in only five of which short bottles were found. Out of a total of more than 500,000 milk bottles inspected 5,812 were seized and destroyed.

The use of short boxes in the sale of ice cream has been practically overcome, and this work means the supervision of about 2,000,000 paper ice-cream measures used annually in the District.

Investigations of short-weight ice complaints consumed considerable time and most of these cases required investigation in the very early morning hours.

Out of approximately 750 spring-balance scales inspected on the semiannual inspection of the scales in use in the several markets in the District only 10 were considered faulty to the extent of being condemned and seized.

We are of the opinion that we have a very complete, simple, and condensed method of keeping records, which is very important for the protection of the officials as well as the public.

IDAHO.

By James H. Wallis, *State Sealer of Weights and Measures.*

I would like to say, gentlemen of the convention, that we have made distinct progress in the matter of weights and measures in Idaho. Our last legislature, which adjourned in March, reenacted our weights and measures law that was vetoed by the governor two years ago, and we now have a complete weights and measures law on our statute books, which provides pretty much the same as the State of Washington. It gives us a legal bushel for about 40 commodities, and requires the net weight to be labeled on all packages of foods—lard, bread, berries, milk, butter, and other things like that.

We have elaborate quarters in our new State capitol building which has just been completed, and when I left we were setting up the stand-

ards which we had received from the Bureau here, who had kindly repaired and readjusted them. We have increased appropriations, an increased number of deputies, and increased powers with regard to city inspection, and altogether I feel that the people of Idaho should be proud of the protection they have received from the legislature in the way of weights and measures legislation.

ILLINOIS.

By Lee G. Metcalf, *President of State Grain Dealers' Association.*

Mr. President, and gentlemen of the conference, I do not know that I have anything to report. This business is all new to me, in a way. I did not receive notice of appointment as a delegate until recently, and I have not had much time to prepare. I want to say, however, that I do not believe Illinois is taking the steps, along the lines suggested by this conference, that it ought to take; but I want to say to you now that we have a very live, energetic, progressive secretary of state in Illinois, Mr. Woods, who by virtue of his office is State sealer, and in a conference with him before I came here he indicated that when I returned home from this conference we would get together and try to do something along the lines suggested by you gentlemen. I am more particularly interested, in our State, in the grain business, being president of the State Grain Dealers' Association of Illinois, one of the largest and most progressive organizations in that State. Two years ago, Mr. President, we established an official scale-testing department, and have a man employed to look after the scales in the State that weigh grain and hay. I think this move is perhaps in harmony with what you gentlemen are trying to do, and I want to say that that has been a great success, even beyond our most sanguine expectations.

Now, I do not know that I have anything else to report this morning, and I can assure you that it shall be my purpose, upon my return to the State of Illinois, to make use of the ideas and suggestions of this conference, with the hope that we can have more adequate laws there governing weights and measures. I thank you.

INDIANA.

By John T. Willett, *Chief Inspector of Weights and Measures.*

Mr. President and delegates, for a long time Indiana has been notably backward so far as legislation on weights and measures is concerned. However, Indiana has had a law which provided for the establishing and maintaining of city departments of weights and measures, but only a few of the larger cities availed themselves of this opportunity to protect themselves. Consequently the law was of very little benefit. With the exception of a few city departments which were fairly well organized, the work was done very indifferently.

Realizing the necessity of a law that would be of greater benefit to the general buying public, and as conditions had become so bad, a law was drafted in 1911 and presented to the legislature, and the only

way by which the law could be properly enforced was by establishing a State department of weights and measures. After some very drastic work and after a number of amendments had been added to the bill, it was finally passed and signed by Gov. Thomas R. Marshall, March 6, 1911.

Now, having the law passed, the next thing was to establish the department. The law did not provide by appropriation any funds for the purchase of equipment or to pay inspectors' expenses to enforce the law, so it was necessary to purchase equipments out of the State food and drug department's appropriation.

The State food and drug commissioner, H. E. Barnard, by virtue of the law, became commissioner of weights and measures and it became his duty to see that the law was enforced, but without funds the work could not be pressed very rapidly. At the time the law became effective I was with the State food and drug department, and having had some eight years experience as inspector of weights and measures at South Bend, the work of enforcing the law was given to me.

One of the first acts was to have all the city and county equipments brought or sent to the State department to be tested and verified by the State standard; and some very interesting weights were brought in, some being as much as one-half ounce either heavy or light. After having tested all of the equipments and approved and sealed those parts that were correct and condemned those parts that were incorrect, and after advising the purchase of parts to replace those condemned, the city and county departments for the first time in the history of the State had standard equipments which they could take into court and to whose correctness they could testify.

In some respects our law is very different from that of other States. While the city and county inspectors are appointed and paid by the city, or county appointing them, yet they can not serve as inspectors of weights and measures until they have first passed an examination, which is given by the State commissioner of weights and measures, to test their ability to perform satisfactorily the duties of the office. While the city and county inspectors perform the duties of inspectors of weights and measures in their respective cities or counties, yet should they neglect to perform those duties, the State commissioner of weights and measures can remove them from office. We feel that while we have only a few inspectors directly connected with the State department, yet our working force is 25, for all the city and county inspectors of weights and measures are deputy inspectors of the State.

A conference of all the city and county inspectors of weights and measures was held at Indianapolis during the month of March, 1912, and at that time the Indiana Sealers' Association was organized. Through these conferences the relationship between its members became very much closer and very good results were obtained, and annually conferences are being held.

Realizing the importance of having the uniform standard berry box, Commissioner Barnard issued a circular letter advising all growers, buyers, and consumers that only the standard dry quart, pint, and half-pint would be permitted to be sold in Indiana; and from this

letter great benefits have been derived by the consumer, for to-day the standard dry quart, pint, and half-pint berry boxes are the only ones being used. To comply with this ruling the largest manufacturers in the State, and others, submitted their berry boxes and baskets to the State department for its approval, and after some alterations in the measurements the boxes were finally approved by this department.

Now, taking up the field work of the State department; during the months of April, May, and June I personally visited about 50 counties, meeting with the mayors and city councils, auditors, and county commissioners, endeavoring to interest them in the appointment of inspectors of weights and measures. While all agreed that such an office was necessary, yet they did not feel that they would be justified in expending the money to maintain the office, but they are fast becoming aware of the fact that such an office is the only protection which the poor man can have against the dishonest merchant. Now, realizing that the city and county authorities would not appoint an inspector of weights and measures while the law was not mandatory, Commissioner Barnard, Isidor Wulfson, and myself drafted the bill presented to the last legislature, making it compulsory in counties of 20,000 population or more to appoint and maintain a county inspector of weights and measures. This was later amended to read 50,000 population instead of 20,000 population. The law also makes it mandatory in the case of cities of the first and second classes to appoint and maintain a weights and measures department, and places the inspector under the law which governs the police and fire departments and provides that the inspectors can not be removed from office for any political reason and only when good and sufficient cause has been presented and a fair trial been given him by the board of public safety.

A number of minor changes were made in the old law, but I speak only of the more important ones. Among them is section 8, which provided that all commodities shall be sold by standard weight, measure, or numerical count.

Fortunately, the last legislature, seeing the necessity of having funds to defray the expense of the State department of weights and measures, appropriated the sum of $5,000 annually for the maintenance of this department, and we hope to accomplish some very good results this year. All the counties having a population of 50,000 or more have appointed inspectors of weights and measures and have purchased the equipments to comply with the law of 1913, and also a number of cities and counties which are not compelled by law to make the appointment have taken advantage of the new law and are creating city and county departments of weights and measures.

While our State law may not compare favorably with that of a number of other State laws on weights and measures, and while our second attempt to improve it has not been as satisfactory as we had hoped, yet it is much better than the law of 1911, and with good success we hope in two years hence to have a law on weights and measures that will be second to none in the United States.

At the present time we are preparing rules and regulations for the guidance of city and county inspectors of weights and measures, and

we hope to have them in the hands of the printer as soon as possible after this conference, as we are waiting to take advantage of any new rules, regulations, specifications, or tolerances which may be made by the Bureau of Standards.

MASSACHUSETTS.

By A. S. K. Clark, *Acting State Commissioner of Weights and Measures.*

Mr. Chairman, I will outline briefly what Massachusetts has done since we have had a separate State department, as I think perhaps it may be interesting.

In Massachusetts we have 33 cities and 321 towns. With the exception of 29 cities and towns, mostly towns, the standards furnished to these cities and towns have been compared by the State department and readjusted to agree with the standards that are furnished by the United States Government and which we have had compared at least two or three times since the department was established. I think that is one of the most important parts of the work that we have done; and we have impressed upon the city and town sealers to be sure that their working sets are kept in agreement with the standards furnished by the State.

During the past year the State department has prosecuted 181 cases in court, on which we have received $1,380 in fines. The cities and towns have prosecuted 221 cases, on which the fines amounted to $2,374, making a total amount received from fines in the State during the past year of $3,754 on 402 cases.

The sealers make their reports to the State department annually on November 15. Up to November 15, 1912, they reported 428,000 different articles tested, of which 178,000 were condemned.

As to the laws that have been passed, Mr. Holbrook has covered the ground pretty well, but I will run over these briefly.

In 1912, since your last conference, there was a law passed that required the sale of dry commodities, fruits, and vegetables to be made by weight rather than by measure. We found that to be a very good law, as in Massachusetts we found dealers selling, say, a peck of potatoes that would vary from 12½ pounds to 15 pounds. Under this present law they are required to give 15 pounds. Take it in the case of spinach. They would fill the peck measure, and we could not tell in making our investigations whether the goods were properly measured or not, and if they were found short in weight, it would always be claimed that they were put up by measure.

In 1913, during the present session of the legislature, 15 petitions affecting weights and measures were presented. Of these, eight were presented by the weights and measures officials of the State; that is, including the city sealers and the Massachusetts Sealers' Association. One bill provided that commodities when sold by weight should be sold by net weight. This bill passed. It met with hardly any opposition in its passage, either in committee or in legislative session, but since it became a law its scope is being questioned and a test case invited. The attorney general has the matter under consideration and, I understand, two city sealers are preparing to bring complaints of

violations of the law. There were also bills presented to require that the measurement of leather be under certain supervision, and to require the testing and sealing of apparatus used in the measurement of leather.

A bill was also presented to require the wholesaler of fruits and vegetables to sell berries in standard-size boxes. At the present time, it is claimed that the wholesaler is not responsible for the size of the baskets in which berries are sold. Such a condition seems hardly fair, and this year a bill was placed before the legislature asking them to include the wholesaler, but the only thing we could get out of it was a resolution to Congress asking that Congress pass a law that would govern the whole country in that matter.

Among the bills not receiving favorable action, in which the weights and measures officials were interested, was one on the recommendation of the commissioner of weights and measures to establish a board of approval for the types of weighing and measuring apparatus that would be placed on the market. This board was to consist of the commissioner of weights and measures, the sealer of the city of Boston, and the sealer of the city of Worcester, but unfortunately the committee decided that no legislation was necessary.

We also had a bill in relation to ice. Under our present law ice may be weighed upon request of the purchaser. We know very well how diffident a customer is to ask the man to weigh the ice when it is brought in; so we asked that a bill be passed making it mandatory that the ice man weigh his ice at the time of delivery. The ice people opposed this bill very strongly, claiming that the consumer would be obliged under such a law to pay 25 per cent more for his ice. The bill passed the house but was killed in the Senate, on the plea that the consumer has sufficient protection under the law that says the dealer shall weigh on request.

In Massachusetts we have no standard shingle. Probably it is the same in a large number of States; and under the law as it now stands, although we receive numerous complaints, we have no grounds for prosecuting. We, therefore, asked this year that the shingle be standardized, that is, to know what a shingle is. We also asked that the bundle of shingles be marked so that the people would know when they were buying shingles how many shingles there were in a bundle. At the present time you will find bundles of shingles with 22 and 23 layers, some 23 and 24, others 24 and 25; but there is no standard bundle of shingles. The dealers came before the committee and said we were disturbing a condition that had been in existence for 50 years, and the bill finally was amended in such a way as to render it practically useless.

The seeds people presented a bill which was passed, establishing different weights on certain kinds of peas and beans. These weights were verified by the State department and that bill went through. They also asked that peas and beans used for seeding purposes be allowed to be put up by dry measure, rather than by weight. That bill is under consideration at this time.

The peddlers, as has been stated by Mr. Holbrook, are very anxious to get back to the use of the dry measure, and they put in a bill this

year to allow them to use dry measures, providing that when they did so they give the legal weight. We had grave doubts as to what the outcome of that would be, and efforts were made to defeat the bill. It was defeated in the senate, but when the seeds bill came up, to allow the seedsmen to put up peas and beans by measure for seeding purposes, the peddlers tacked on an amendment, and it almost got through; but when it came to the senate the senate refused to agree with the house, and it is now between the two bodies. The remaining petitions were of little value to us as weights and measures officials, and were all given leave to withdraw.

I feel that you will agree with me that Massachusetts is still alive to the interests of weights and measures, and although we have not attained favorable action on all our propositions, yet we feel encouraged.

We have in Massachusetts an organization of the sealers, a body which is growing stronger and working more in harmony each year.

The State department has from its inception been working with these objects in view: The better protection of the citizens of the Commonwealth; to increase the efficiency of the departments of the cities and towns where such was a necessity; to see that all the departments were supplied with proper equipment and, so far as possible, to assist in securing for the sealers sufficient remuneration for the work required of them. We feel that great improvement has been accomplished during the past six years. The sealer's office is no longer, as in the past, considered of minor importance. The official himself is proud of his calling. At first, some of the city and town officials showed resentment at what probably appeared to them to be interference on the part of the State, but to-day virtually all of the departments are working in harmony and with one object in view, namely, to better the conditions of trade and to afford protection to all.

What we need is uniformity in weights and measures throughout the United States. I personally look forward to the time when we shall have national laws to regulate all the States of the Union and on the same lines. I trust that before long we shall have established tolerances to govern all weights and measures officials in their work—tolerances that have been derived from scientific investigation.

I thank you, Mr. Chairman, for this opportunity.

The CHAIRMAN. Mr. Clark's statement brings to mind one fact, and that is we should not be discouraged because legislation does not pass the first time. Legislators are very prone to defer action at least a year. I have heard Members of Congress say time and time again that very few bills are presented in the right shape the first time. I remember hearing one chairman of a very important committee say that he liked to have a bill before the committee at least two years, and then if the department, or the interests presenting it, did not change their minds in that time, he was pretty sure it was the right thing. The great point in this whole matter is that, in presenting legislation that you think ought to be enacted, it brings to the mind of the legislators the real need for it; they think of it; it keeps it alive before them; and the fact that a bill fails to pass is no indication at all that it has not been productive of good.

Mr. NEALE (representing Minnesota). Mr. President, inasmuch as I am on your set program, I would like to yield my short time to Mr. Thompson, the executive officer for the railway commission, who will be able to tell you something of interest along the line that the bureau is working on, in securing a master track scale and test cars for the State of Minnesota.

MINNESOTA.

By W. E. THOMPSON, *Representing the State Railroad and Warehouse Commission.*

Mr. Chairman and gentlemen, it is a pleasure for me to be here to-day and to speak to this assembly, not in the capacity of a technical man, but as a representative of the Minnesota Railroad and Warehouse Commission, speaking rather in an executive capacity, particularly as to the difficulties we, in Minnesota, have been finding for a number of years with the larger weighing machines, or in other words, the track-scale weighing equipment, provided by the carriers and by the various industries. Minnesota, I believe, is rather a pioneer in the matter of State inspection and testing of railroad-track scales, having enacted chapter 357 of the Laws of 1907, which law imposed the duty on the Minnesota commission of inspecting and testing all railroad-track scales in the State. Mr. Neale was the scale expert for the Minnesota commission at that time and carried that work out successfully, devoting his entire time to the railroad-track scales, until his advancement to the higher office of commissioner of weights and measures of the State, by the appointment of the railroad and warehouse commission. Since that time the work of testing the railroad-track scales has been taken up by other scale experts for our commission.

We found chaotic conditions during the first part of the five and one-half years of this work, but these conditions are gradually being straightened out and we have in our work secured the hearty cooperation of all the carriers in the State in our efforts to secure and assist in maintaining better weighing facilities.

The carriers at first were a little skeptical as to what might be accomplished under the requirements of this law. They perhaps thought that the State was putting a little something over on them. The law required the duty of inspection and testing to be performed by the commission's experts and placed the burden of paying the cost directly upon the carriers.

The commission completed a test of all of the scales in the State, retesting such as were necessary after the repairs had been made, and at the conclusion of the year's work determined the actual cost for the same, and then assessed that cost upon the carriers pro rata per scale.

This was the initial step in this work and since that time we have had additional legislation and have within the past year adopted standard specifications, or rather requirements, for the construction of railroad-track scales, dealing largely with the foundations for the equipment, which the carriers are approving and are putting in to-day; so that our track-scale weighing equipment in Minnesota is materially better than it has ever been before.

At the last session of the legislature, which has just adjourned, two bills were passed; one was an amendment to an existing law, which required the free movement of our test cars to any carrier's scale or any track scale owned by any industry; and the other, a new law, provided for the purchase of two new track-scale testing cars and a master track scale, with a suitable house over it. The commission's chief engineer prepared the plans and specifications for the two new cars and we feel that they are models for Minnesota, although they do not conform exactly to the ideas of the bureau in respect to track-scale testing equipment. Mr. Fischer spoke of the idea of the wear and tear on the wheelage and the trucks of the cars moving for that purpose, and while we considered that, and we knew that we would occasionally have to prove up our testing equipment, we provided for that in this way: The cars are all steel, with the exception of the wood running board creosoted, which was put on to comply with the United States safety appliance act. We put in each car 12,000 pounds of sealed United States standard 50-pound tests weights in templets on the floor of the car. These are readily accessible to the scale inspector in proving any scale or for proving the test car at any time.

The contract for the master track scale was not let before I left but I expect by this time that it has been let, and that the survey has been made for its location at Minnesota Transfer, which is a large shipping point in Minnesota where many of our roads converge.

We feel that Minnesota has taken an advanced step in the last few years along the line of securing weighing facilities of larger capacity and more substantial constructions.

I do not know that I could go any further into this without boring you with details. Suffice it to say that we are glad that the bureau has taken the stand it has, and we feel that many of these questions, brought out in the hearings of the Interstate Commerce Commission, to which Mr. Fischer referred, one of which I was able to attend and for which the Minnesota commission prepared a large amount of data, will bear fruit. The data prepared in Minnesota disclosed the fact that railroad stenciled tare weights on box cars did not tally with the actual weight of those cars when weighed under careful strict State supervision, the cars being cut at both ends and the scales over which the weights were taken carefully inspected by State men and kept continually correct. We believe the net results of those investigations by the Minnesota commission disclosed the fact that the carriers, if commodities were carried on the basis of the stenciled weights, were losing vast amounts of tonnage. Our scale inspection showed more often that scales were weighing less than standard, than more than standard, and the results to the carriers and to the shippers has been materially bettered as this work has progressed.

We have in Minnesota many track scale weighing points where State weights are furnished, and at these points, when the stenciled weight of a box car does not tally with the actual State weights taken with the car on the scale, cut at both ends, the stenciled weights are corrected within a very few hours.

I believe this is all, gentlemen, and I thank you.

The SECRETARY. Mr. Chairman, I would like to say just a word here because I am afraid we may not have an opportunity to take up this question again. I do not want to have any one think that we claim any superiority for our particular car, but our problem is somewhat different from that of a State. In the State of Minnesota you can have master scales at different points with which to test your cars frequently, if you see fit; but we may load our car with these weights and send it out to the far West and it may be gone six months. If it has to be repaired, we would have to haul it way back to Washington to get access to the master scale before we could check it up again. So the problem is somewhat different. It is up to us to see that the equipment will be constant for a long period of time and over long journeys.

The CHAIRMAN. I am very glad, Mr. Fischer has brought out that point. The bureau must look at some of these questions from a little different standpoint than that of the States. To my mind one of the most valuable features of this work will be in the case of States where nothing has been done, and which are just starting to work. They must have something in the way of a standard within these States. And they are welcome to anything that we may have.

There is another phase of the work which I want to point out, and that is the interstate commerce regulations. There is not any doubt in my mind but what the actual testing of weights in connection with that will be carried on by this bureau. It would be very strange if it were not, because it is a function of this bureau; and we are looking forward to that. This is but an experimental car, and it will undoubtedly be supplemented very soon by a number of others. I am pleased to see that there is so much interest taken in this subject, because it is in a way as important as these other matters of weights and measures.

MISSISSIPPI.

By W. F. HAND, STATE CHEMIST.

Mr. President, I shall have to content myself now with a progress report. I had the pleasure of attending a conference several years ago, and, since that time, a good deal of interest has been taken in the question of weights and measures by the governors of our State. Gov. Noel, at whose request I came to your sixth conference, was so impressed with the desirability of proper legislation concerning weights and measures that he made specific recommendations to our legislature. Our present executive, Gov. Brewer, is also much interested in the matter, and he asked me to come here with a view of securing as much information as possible. I feel certain that he will be glad to bring the matter again to the attention of our legislature, and to impress upon them the necessity of inaugurating in our State a proper system of inspection of weights and measures.

I need not add that I am glad to be here again.

The CHAIRMAN. That is the kind of talk we like to hear. I firmly believe that if we can just get one delegate once from every State in the Union, we will have all represented thereafter. Lack of repre-

sentation does not arise from any antipathy to weights and measures; it is just inertia, pure inertia. There are a great many people in the States, governors and others, who would be thoroughly enthusiastic if they could only be brought in contact with the work, and they will be sooner or later.

NEW JERSEY.

By W. L. Waldron, *State Superintendent of Weights and Measures.*

Mr. President and gentlemen, since the conference held here in February, 1912, I am pleased to report that New Jersey has made excellent progress in weights and measures work. Legislation has been enacted calculated to assist and strengthen our department, and the results attained thus far have proven very gratifying.

One of the most important of our accomplishments last year, I think, was the formation of a permanent association of superintendents. The objects of the association are clearly set forth in the preamble to the constitution and by-laws, which I quote:

> Whereas, it is necessary, in order to secure the very best results, to work harmoniously at all times and in all places; and, Whereas, we do all firmly believe in these principles and in organization; therefore, we do constitute ourselves the New Jersey Association of Superintendents of Weights and Measures.

Every superintendent in the State joined the new organization. The splendid results of the first year's efforts of the association lead me to believe that the organization will be a power for good. Meetings are held annually. At these gatherings interesting topics are discussed, city and county superintendents make verbal reports of their work, needed legislation is considered, different types of apparatus are demonstrated, and a general exchange of views takes place. Such meetings and such programs are sources of interest and instruction. Our meetings have been largely attended, and all the superintendents have given freely of their time to advance the work of the association. It is pleasing to have willing workers in any cause; particularly is this true of our work.

Much of the legislation on weights and measures effective in New Jersey at this date can be directly traced to the efforts of the superintendents' association. Among the more important laws the association has been largely instrumental in having enacted may be cited the following:

The law regulating the sizes for sale of milk and cream bottles. Prior to the passage of the present law odd sizes were found everywhere throughout New Jersey. This condition no longer obtains. Only standard sizes are in use and all are marked with a designating number supplied by our department. Designating numbers enable us more readily to detect violations of law.

New Jersey for a long time was without effective legislation covering the subject of baskets used for the sale of fruits, berries, and vegetables. This state of affairs claimed the attention of the superintendents' association, with this result: The legislature, at its last session, enacted a law which regulates the sizes of baskets and boxes to be used for the sale of the commodities mentioned. Boxes for berries and small fruits must hereafter (beginning Nov. 1, 1913) be

of the capacity of 1 pint and 1 quart standard dry measurement; baskets used for sale of fruits, vegetables, etc., shall be of the following sizes: 2, 4, 8, 16, 20, and 32 quarts. By this law we abolish the odd sizes and the consumers of the State will be saved thousands of dollars.

The butter regulation now operative in New Jersey was first suggested by the superintendents' association. This ruling requires the marking of net weight of butter on the outside of wrapper or carton. Superintendents insist upon compliance with ruling. The practice of weighing in heavy wooden dishes when selling butter and lard has also been prohibited.

The enactment of the tenure of office act was also brought about by the efforts of the association. This law provides for the retention in office of city and county superintendents of weights and measures during good behavior. They can not now be removed, discharged, or reduced in pay or position except for inefficiency, incapacity, conduct unbecoming an employee, or other just cause. I consider this an excellent law, as it has eliminated in New Jersey the pernicious political influences formerly apparent. Superintendents now fully realize they can best retain their positions by securing results. And these they have been earnestly striving to secure. The act is already responsible for a great improvement in the work in New Jersey, and I look for continued improvement. Another good measure passed on the recommendation of the association provides for the payment of legitimate expenses, such as transportation, livery, telephone, telegraph, and postal charges, incurred by county superintendents of weights and measures in the performance of their duties. Boards of chosen freeholders are authorized to pay such expenses when the bills are itemized and properly sworn to.

This brief synopsis of New Jersey laws would not be complete if I did not include two important amendments to our law passed this year. The first of these features provides that all superintendents be vested with police privileges. They can, under the provisions of the amendment, arrest offenders wherever and whenever found. Formerly it was necessary to procure a warrant before offenders could be arrested. This addition to the law has already proven its worth, and I look for it to prove a source of great assistance to superintendents.

The second amendment provides that county superintendents of weights and measures can bring their cases before any district court judge or city magistrate in the town, city, or village in which the offense is committed. In this way the cases can be settled with greater expediency than ever before. Formerly it was necessary to bring cases to the notice of the county prosecutor. This plan resulted in vexatious delays and quite some expense, both of which have been eliminated by the passage of the amendment referred to above. It is expected to greatly help superintendents.

The foregoing about concludes our legislative achievements since the conference here in 1912, but before concluding I wish to draw attention to two other important accomplishments. The first of these is the fact that every county in New Jersey has appointed a super-

intendent of weights and measures. Several of the counties have appointed assistants, while all of the municipalities have well-organized and well-equipped departments. The work in the State is carried on in an exacting, able manner, and I haven't any hesitancy in stating that New Jersey at this time is in better condition than ever known before. Much credit is due the superintendents for their vigilance and efforts. Our aim is to keep the standards in New Jersey on a high plane; and so far, I am certain we have succeeded.

The other accomplishment worthy of noting here was the large number of exhibits conducted by city and county superintendents during the year. Each of the municipalities and nearly all of the counties held displays of confiscated weights, measures, baskets, boxes, etc., and all were largely attended. Interesting literature was distributed at these displays, and in this way the future cooperation of housewives was provided for. The superintendents were constantly on hand at these exhibits, explaining and demonstrating the uses the confiscated equipment was put to, and these lectures were attentively listened to. It might be worth noting here that at one display the State department conducted for one week over 100,000 persons called at the exhibit. Granting that only one-quarter—a very mild estimate—of those calling were impressed by what they saw and heard, we are confronted with the fact that a very good sentiment is created. It is surprising the interest that can be aroused in communities by these displays. I firmly believe in them and advocate their being held whenever possible. They are a source of considerable benefit to consumer and superintendent alike.

NEW MEXICO.

By L. P. Martinez.

Mr. President, I have no report to make. I am not officially connected with the State, and have been out of the State for over a year now. I did not even know that New Mexico had enacted any weights and measures law until Mr. Holbrook spoke about it. I was very much impressed with the fact that he consumed more time criticising the laws of my State than he did with any other State, and I trust the next time an inspector goes down into New Mexico he will be directed to call upon the officials of the State and impress upon them the importance of having satisfactory weights and measures legislation enacted by the State legislature.

That is about all I have to say, Mr. President.

NEW YORK.

By C. E. Keach.

Mr. Chairman, I came here to listen and not to talk. I would like to request Mr. Rinehart, from Seattle, and also Mr. Steinel, from Milwaukee, to furnish me, if they will, at some convenient time, copies of the laws that they have in their States; because I am here to look after the law question entirely—nothing relating to weights and measures—and I would make the same request of any of you gentlemen who may have anything of that character.

OHIO.

By S. E. Strode, *State Sealer of Weights and Measures.*

Mr. Chairman, Ohio is unique in one way. It is the only State, so far as I know, that elects its State sealer. Now, it is not on the ticket that way, and I felt as though I had been taken an undue advantage of when I was elected. They elected me as dairy and food commissioner, and then later said that by virtue of that office I was also State sealer. Well, a person might have the qualifications for a dairy and food commissioner, and good ones, and yet have none whatever for the office of State sealer; and yet I can see something in common between the two. They both deal with food and they both also deal with a species of unfair and unjust competition.

They have a habit in Ohio, whenever they start new work and do not want to create a new department, of saddling it upon the dairy and food commissioner. For example, there has been added the collection of the liquor tax, drug inspections, etc. He is a sort of general trouble maker; and I suppose that is another reason why they thought the office of State sealer should come under his department. I never regarded it as an asset in vote getting—stirring up trouble, confiscating scales, and prosecuting offenders—but we went right to work at it, making a rigid enforcement of what laws we had and could get; and I was very much gratified at the results, although we lost a great many votes—the first time I think my majority was 8,000, and the next time 136,000.

We found that we had no tools to work with. The legislature was half through two years ago when we took office, but we began immediately to get some tools in the shape of laws, and we got a few, but not very many. We have been able to accomplish a great deal with the imperfect tools, but we are going to have better tools now. Mr. Holbrook has told you of how we have been able this last year to strengthen our weights and measures laws. They gave us about everything we asked for, and the reason they did that was that they had to do it. We began a campaign throughout the State of agitation, education, publicity, and press work by weights and measures exhibits, and then also by State conferences. We had a bigger conference over at Columbus a year ago than the proportions here have assumed so far, and we had about as good talent there as you have here. We have a live bunch of fellows over in Ohio. Also we made importations. From Washington, Mr. Fischer was there, from Massachusetts we had Mr. Palmer, from New York we had Dr. Reichmann; and then we had John Connors there. We had a great meeting. We got into the press. Not only that, but at the centennial we had a weights and measures booth, and we showed the people how they had been fleeced. We had them there from all over the State. We helped them in the counties to get up similar chambers of horrors. And that was discussed last fall in the legislature about as much as politics, and they couldn't do otherwise than do just what we asked them to do. There is a point for some of you fellows if you want to strengthen your laws.

These laws have not gone into effect yet; it requires 90 days over there, since we have voted for the initiative and referendum, unless they are emergency measures. They ought to have been put in as emergency measures.

We have 74 county sealers at work and two years ago we did not have any. They are worked, too. We have about 20 good city sealers at work. We have increased appropriations this year. We have an extra State man at work, and you are going to hear from Ohio in time to come on this great work of protecting the common people in their purchases.

PENNSYLVANIA.

By J. SWEENEY, *Chief of the State Bureau of Standards.*

Mr. President, I do not know that there is very much that I can say that will be of interest to this conference. We are situated about as Ohio was two years ago. We did not have any inspectors of weights and measures. To-day we have about 50. The State does no inspecting; that power is vested in the county and city inspectors. The State really has no jurisdiction over inspectors except to verify the equipment which they use. We are now making an effort to get some legislation that will improve the present law in the State. There are two bills pending in the legislature; one bill is to regulate the sale of commodities and the other is to give power to and fix the salaries and tenure of office of the county and city sealers and to provide for the payment of their expenses. The work that has been done by these 50 sealers throughout the State has been very satisfactory and has been of great value and protection to the people in their purchases.

RHODE ISLAND.

By W. F. GOODWIN, *State Sealer of Weights and Measures.*

Mr. President and gentlemen, while Rhode Island has not recently enacted any legislation or tried to enact any on the subject of weights and measures, she is enforcing what she has. The reason that no laws have been advocated by the State sealer and the local sealers of the State of Rhode Island is that we are waiting for the measures which are being formulated by these conferences to become Federal laws, so that we may not conflict with anything done by the Federal Government.

In the State of Rhode Island there is not much enthusiasm shown, for the simple reason that our legislature is not in harmony with many of the things that are being done. For instance, this year no appropriation has been made for traveling expenses for my office. You can imagine a man with an office and with no funds to carry out the duties of that office. In appealing to the governor and making known the conditions, I said: "I can not believe, your honor, that this thing has been brought about from a malicious standpoint; I think it must be a mistake." But I want to assure the delegates present from the other States that the office is going to be administered just the same by the State sealer at his expense. My interest is too great in this

matter to allow it to degenerate; therefore I am going to take care of the business, at my own expense, if necessary, and see that the sealing laws are enforced.

I have been promised by the committee on finance that next year they will make it up. I do not want any more money than is actually necessary to carry out the provisions of the sealing laws in the State of Rhode Island nor do I expect any.

I had a conference with our governor, who is very much interested in everything pertaining to the best interests of the people of our State. I am here through his graciousness and good feeling for the objects of these conferences. He insisted that Rhode Island must be represented, although he had not himself received any appropriation for this purpose; but through his good feeling and interest in such things as this, he thought the State ought to be represented, and he said, "I want you to go." So I am here. I hope and trust that this present year, with the powers of reform in office, some Federal laws will be enacted to bring about a uniform weights and measures law to regulate all these things that these conferences have been formulating and advocating. I hope that some legislation will be passed so that it will not be necessary for the States, individually, to take this subject up and make laws that are going to conflict later with Federal legislation that may be enacted; and we are waiting in Rhode Island, Mr. President, for that time to come. I thank you.

The CHAIRMAN. There are four or five more delegates to be heard, but the hour for adjournment has arrived, and luncheon will be served, as has been announced already, on the top floor of the west building at 1 o'clock.

The SECRETARY. Mr. Chairman, I would like to make an announcement. The board, that I mentioned as having charge of formulating rules and regulations and establishing tolerances for the enforcement of the food and drugs act, is very anxious to get some information from the gentlemen present. There are certain questions on which they want to get information, and I will be glad to read these questions to you and to say something regarding them later:

First. What are the requirements in your State regarding the method of stating the weight, measure, and numerical count, and in what terms are they required to be stated?

Second. Should the required statement be made on the principal label, on a separate label, or, in the case of bottles, blown in the bottle?

Third. In your opinion what tolerances or reasonable variations should be permitted? Should these variations be as often above as below the marked weight, measure, or numerical count?

Fourth. What exemptions, if any, should be made regarding small packages, and if such exemptions are to be made, why, in your opinion, should they be made?

Fifth. In your opinion will there be any conflict between State laws and the national law; and if so, where, and how can it be avoided?

Now, in order to give the gentlemen present an opportunity to express themselves on these various points, or to give us an opportunity to hear what they have to say—perhaps that would be a better way of putting it—we have arranged to have a hearing at the Raleigh Hotel at 3.30 to-morrow, and those members of the conference who

would prefer to come down there and give information on these points rather than come out here will have that opportunity.

We have Dr. Alsberg with us. I do not know whether he cares to supplement anything I have said. If he does, we shall be very glad to have him do so.

Dr. ALSBERG. I thank you very much. I do not think I have anything further to say. We discussed this matter yesterday—Mr. Fischer and I and one or two others—and agreed that Mr. Fischer would make this announcement; and we hope that such of you gentlemen as have information on this subject will give us an opportunity of acquiring that information, because we want to make recommendations for the regulations in the light of as much information as it is possible for us to get. I hope that you will help us in that way tomorrow.

Thereupon, at 12.45 p. m., a recess was taken for luncheon.

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SECOND SESSION (AFTERNOON OF WEDNESDAY, MAY 14, 1913).

Mr. H. H. Henry presiding.

REPORTS OF STATE DELEGATES (CONTINUED).

TENNESSEE.

By T. F. Mahoney, *Sealer of Weights and Measures, Chattanooga.*

Mr. Chairman and gentlemen, I thank you for extending me the honor of attending this convention, and I appreciate also the honor conferred by my State and our governor and the city of Chattanooga in sending me here. I did not come here with the purpose of trying to tell you anything; I came here to learn.

Our weights and measures law in the State of Tennessee is very weak, but we have a bill pending in the legislature now which will, if passed, materially remedy our weights and measures law. At the present time, however, it is difficult to get our legislature together—part of them are in Middleboro, Ky., and the others are in Tennessee, and we can not do anything with them.

I will read you a little report that I have here, and perhaps before the convention adjourns I can tell you more:

Measures stamped and tested	873
Measures condemned	188
Scales stamped and tested	551
Scales condemned	125
Arrests made	5

The biggest short-weight case found in our city during 1912–13 was a coal shortage amounting to 580 pounds on a ton and, gentlemen, I want to tell you that I am not through with them yet.

VERMONT.

By H. H. Henry, *State Commissioner of Weights and Measures.*

Mr. Chairman and gentlemen, in regard to legislation in the State of Vermont, I have not a very brilliant report to make, but I think we have accomplished something in the way Doctor Stratton suggested. We made four attempts at legislation, and laid particular stress upon the passage of a net container package act—labeling of packages as to their net contents—and in that we were unsuccessful; but it was really through misfortune, I think, that the bill was lost—a sort of political misfortune—and it seemed to me that the writing was clearly on the wall, so that I have every reason to believe that two years from now Vermont will have a net container package act.

We also tried to effect the passage of legislation in regard to the measurement of shingles, the same as was attempted in Massachusetts, but we combined with that the measurement of wood and lumber. In Vermont more or less lumber is sold in small quantities by the small farmer to the lumber merchant. That condition exists in a few other States. A peculiar thing with regard to the measurement of lumber is that there are something like 40 different rules for measuring. This presents an exceptionally good opportunity for fraud, not in the selling but in the buying. The lumber dealer does the buying from the farmer. You can imagine if a pound of sugar meant 40 different quantities what an opportunity there would be for defrauding the customer in selling sugar. That is exactly the situation in the lumber business. But we were unsuccessful in that bill. It passed the house by a substantial majority and went to the senate, and after a confused session, lasting all the afternoon, it was killed. It would have been recalled the next morning if it had not been the last week of the session, but on account of pressure of time the vote to reconsider was lost. But now there is little question but what that legislation will be effected.

There was enacted a general amendment to the law passed two years ago establishing the department. In many respects I think the amendment was an improvement. For instance, in looking over the laws of the different States, I have found that there has been a lack of protection to the seller where the transaction is based upon the measurement by the purchaser. Most of our laws provide a sufficient penalty for delivering a less quantity than represented, but provide no penalty for a purchaser who misrepresents the amount purchased, even though he and he only has control of the measurement of the quantity, like this lumber purchasing. That is one example; but there are many examples; for instance, the tradesman who buys small quantities of meat from the farmer who has no scale. In that case the merchant usually does the weighing of the meat purchased. I find that Minnesota has a law which protects that end of it, protects the selling as well as the purchasing end. But in many States there is no such law, and I think that is a great mistake. In Vermont we had no protection. We had a great many complaints of fraud in the matter of purchasing, and I had to answer all these complainants and say that we could give them no protection. There is now drafted into our law a provision against fraudulent buying as well as fraudulent selling.

We previously had a provision in our law that we could test commodities which are put up ready for delivery. That has been amended by adding the right to seize whatever packages or commodities are found to be sold in violation of the law. That makes the law of examining those commodities effective where it was not effective before, and we have had occasion to use that right several times since the law was enacted.

Furthermore, we were given specific jurisdiction over the scales used by common carriers. Before, under the clause "scales used in trade," it was rather questionable whether or not we had that jurisdiction.

There was also passed a complete and mandatory weight-per-bushel law in the State of Vermont, and in which we changed the weight of a bushel of apples to conform to that in New York, Massachusetts, and New Hampshire, and also our bushel of beans. Formerly we were unique, I think, in having a 62-pound bushel of beans. We changed that to 60 pounds, and apples from 46 to 48. We have now a list of 50 commodities, I believe, which have a specific weight per bushel, whereas before we had 19.

The addition to the work of the department has been mainly in the testing of cream-test scales, and I was glad to hear that the representative from Wisconsin had taken a big interest in that matter. That seems to be a matter neglected by the largest class of sealers throughout the United States, so far as I can learn; but it is really most important, because a very slight inaccuracy or lack of sensitiveness in a cream-test scale makes a tremendous amount of error in the resulting calculation. If you multiply that by the days in the year and the number of people using those cream-test scales, you will find that the avoidable loss to one party or the other is tremendous. I have had a few creameries make tests themselves on scales which were inaccurate and scales which we found to be accurate, and the two or three creamery men who made these tests—we had nothing to do with it, because we wanted the tests made by commercial men, not sealers—figured that in our small State there was a loss, either to the buyer or the seller of the cream, of something like $200,000 a year. So it is a work that can not well be neglected, and we have started that work.

VIRGINIA.

By J. W. Richardson, *Superintendent of Weights and Measures.*

Mr. Chairman and gentlemen of the conference, I am gratified to see such a largely increased attendance over that of our first conference, held on January 16 and 17, 1905, when only eight States and the District of Columbia were represented, there now being present the representatitves of 21 States and 37 cities and counties, thus showing the growing interest in the question of uniformity of weights and measures, and I trust that all the States not represented here to-day will be at the next meeting.

This being our eighth meeting I hope the conference will get right down to business, and frame something tangible as suggestive of laws for presentation to the general assemblies of all the States for enactment, looking to the accomplishment of uniformity and better methods along all lines touching weights and measures and that will also appeal to the Congress of the United States.

Having held eight conferences the States which have been regularly sending and paying the expenses of their representatives to the same will become impatient of this outlay unless, as I have just said, something tangible is done for the representatives to report.

Awaiting the action of this conference, our general assembly has taken no cognizance of laws relating to weights and measures except to amend the law fixing the standard of weights of farm products by

adding alfalfa and soja beans, etc., products that have been grown by our farmers only in the past few years.

Thanking you for your attention and hoping that much good work may be the result of this conference, I shall, for the present, have nothing more to say.

WASHINGTON.

By I. M. Howell, *Secretary of State.*

Mr. Chairman, I had not expected to be called upon for any remarks at this convention. Without wishing to be facetious, we in the West have experienced the result that our delegates who are sent here to Washington hardly ever get to say anything until they have been here two or three terms, and then they do not always pay a great deal of attention to them. However, I consider it a privilege to be on the floor for a few moments.

The gentleman who addressed you on the subject of the new laws has covered all the points with reference to Washington, I believe, with the exception, perhaps, of a union of counties, in cases where the counties are small in which the law gives an opportunity to combine with other counties and use the same paraphernalia and the same man in covering the territory.

I want to say that for the past 12 years I have been the State sealer of weights and measures in some capacity, but in name only. I, as county auditor of one of the counties, endeavored several times under the former law to make arrests and enforce the weights and measures laws, but found that it was impossible to do so under the laws we then had. When I became secretary of state I took upon myself the effort to get new legislation through the legislature; and in this connection I want to compliment the Bureau of Standards for their efforts along that line. They sent Mr. Holbrook to the State of Washington and he checked up a number of the cities and found them in such bad condition that he made a report that interested a number of our citizens and members of the legislature, and that enabled us the following year to get a law through one house of the legislature. That is your uniform bill. The next year we started in a little earlier on it, and it passed both houses and was signed by the governor. We have an appropriation of $14,000 to run us through the two years.

Knowing that we would meet some opposition in the State to this law, I endeavored to send out a feeler by writing a letter to all of the county auditors who are ex officio county sealers and superintendents of weights and measures under the new law, with a view to finding out if they wished me to make any purchases for them in getting the standards and weights during this trip. I was pleased to receive replies from some 10 or 12 of them, authorizing me to purchase their supplies; and that, of course, means more counties than the number indicates, because a number are making unions with other counties. So we feel that we are going to have at least some of them with us in this movement. In those counties which do not take to it kindly I propose to put the deputies that are in the State department—all of the county departments are directly under the State department—

into these counties with picture machines and talks to educate the people, and bring pressure to bear upon the county commissioners who have the hiring of the deputy, to such an extent that they will give us all assistance possible. This is the plan I have outlined and I hope it will be a success.

WEST VIRGINIA.

By S. B. Montgomery.

Mr. Chairman and gentlemen of the conference, last Saturday, at my hotel in Charleston, I was called to the telephone by our governor, and he informed me of this conference, told me of its importance to the people of West Virginia, and asked me if I would come here as a delegate. I told him that I would. On Monday morning his secretary brought me my commission to the hotel, and as it is very brief I will read it:

Dear Sir: The Eighth Annual Conference on Weights and Measures of the United States will be held at the Bureau of Standards in the city of Washington on May 14 to 17, inclusive. It affords me a great deal of pleasure to designate you as a representative to this conference to represent the State of West Virginia. I regret exceedingly to say that there are no funds from which to pay your expenses.

I will just say that the governor forgot to mention that when he called me over the telephone. But knowing that I was a soldier of the common good, as all good citizens ought to be, he took it for granted that that would not make any difference; and it does not.

In view of the importance of proper supervision of weights and measures to the people of every community, it is essential that West Virginia be represented. This letter will serve as your credential for admission and authority to participate in the conference.

Very truly, yours,

H. D. Hatfield, *Governor.*

Now, like the gentleman from Illinois, this is a new departure for me, and I approached the task with fear and trembling, and am somewhat scared yet. I felt very much embarrassed when the roll call of States began, and when we received such splendid reports from the States first called; and at that period of this conference I felt that perhaps I had better slip out while the going was good. But when the great sister States of Ohio and Pennsylvania, whose splendid citizenship has contributed so much to the young Commonwealth that I represent, told you gentlemen that they had just begun to enact these laws two years ago, I felt that West Virginia was safe and could hold her seat in this conference for a while anyhow.

The governor informed me that West Virginia practically has no law on weights and measures, but the secretary to the governor, when he gave me my commission, brought to my attention house bill No. 65, which was introduced in the legislature which just recently adjourned. This bill passed the house, but, owing, I think, largely to a senatorial deadlock which we had in West Virginia, died on the senate calendar. So far as I know there was no united opposition to it. I want to leave it here with the secretary, and if we have time I would like for the experts in this conference to consider this bill and see whether it is modeled after your model law or not; because the Legislature of West Virginia only meets every two years, and the

session is limited by law to 45 days, so you see we do not have much opportunity to get any reform legislation; but we are happy in having a progressive and talented governor in West Virginia at this time, and he tells me that he intends to call an extraordinary session of the legislature some time this fall, probably in October, and he said to me that he would include this very important question in his call.

This bill, I see, provides that the director of the physical laboratory of the West Virginia University shall, by virtue of his position, be the superintendent of weights and measures; but it goes ahead and provides that he can recommend to the governor an assistant superintendent, who shall be the active field man, and his salary shall be $1,500 per year. It also provides for an appropriation of $8,000 to carry on the work, and I notice that it has some very heavy penalties for the violation of the law.

Mr. Chairman, I am not familiar with this work, but I am sincerely interested, since I have come here and found you men who are deeply interested and who understand how vitally this great question goes into the homes and enters into the high cost of living, and I promise you that I intend to remain silent in my seat and hear from you experts and consult with the officers of the United States Government here, and get all the data and information that I can; and I intend to make a thorough and exhaustive report to the governor of the State of West Virginia, and submit to him the model law which these experts have drawn, and I assure you gentlemen that if it is ever my happy privilege to meet with this conference again, West Virginia will report that she is in the advance in legislation along this line.

The ACTING CHAIRMAN. As I understand it, the discussion of that law had best take place on Saturday morning, at which time Mr. Holbrook of the Bureau of Standards is to give us a paper on amendments and additions to the model law, and we can take up the discussion of the law at that time.

WISCONSIN.

By F. P. DOWNING, *Chief Inspector of Weights and Measures.*

Mr. Chairman, about two years ago Wisconsin was in the same position regarding weights and measures enforcement as West Virginia is to-day. We had no live department of weights and measures. It gives me great pleasure to report that we now have a most excellent law, and, what is better, that we are enforcing the provisions of that law. I do not mean to say that we are entirely satisfied with the present State law on weights and measures. We are not. A number of amendments were introduced at the present session of the legislature which we hope will pass.

Under the present law (which is patterned after the model law recommended by the bureau, with various modifications) the State superintendent not only has supervision over weights and measures, but the State has to do the actual testing and sealing in all towns under 5,000 inhabitants. We have no county sealers, but we have 35 city sealers. These sealers are all under civil service, and the

expenses of running the city departments are defrayed by the local city governments.

With regard to the legislation that we wish to enact, I can say that we desire the passage of a net-container bill patterned after the law that recently passed Congress. We want a standard beer barrel for Wisconsin. As you know, beer is a representative product of Wisconsin. We want the beer barrel to conform with the revenue standard of 31 gallons instead of 31½.

There is one line of work that Wisconsin is doing—and Wisconsin is one of the few States doing it—and that work consists of testing cream-test scales and milk and cream test bottles. This testing is done at our office at the capitol. We have found a large number of such milk and cream test bottles to be inaccurately graduated. Now, Wisconsin is not only the beer State, but it is the dairy State. Millions of dollars are invested in the dairy industry, and if the glassware that is used is inaccurate, it will mean a great loss to the farmers and creameries of the State. We have been experimenting with different types of cream-test scales used in the factories of the State, and we find that the 12-bottle test scale is not sufficiently sensitive for the work of weighing 9 and 18 gram samples of cream. Great errors creep in.

Of the 35 cities in Wisconsin that have city departments of weights and measures, about half have adopted the model city ordinance recommended by the Bureau of Standards. Some of them have gone even further. There are four of our cities in Wisconsin that have adopted a sales-slip clause. I think Fond du Lac was the first city. Under the provisions of this ordinance all goods sold by weight or measure must be accompanied with a sales slip, or the package must be marked to show the actual weight or measure. The ordinance reads as follows:

> Every package containing commodities sold by weight or measure within the city of Fond du Lac shall have marked upon it or be accompanied by a sales slip upon which is marked in plain figures the actual weight or amount of the contents contained therein, and the seller of any such commodity who fails to comply with the above provision shall be fined not less than $5 nor more than $100 for each offense.

The city sealer of Fond du Lac informs me that since the passage of this ordinance the "trimmings" on meat in his city have decreased by one-half. It was the policy of the butchers to cut off along with the bone a lot of meat and sell it over again. The passage and enforcement of this ordinance has put a stop to this practice.

I want to say just one word with regard to the decision of the United States Supreme Court in the "glucose mixture" case that was mentioned this morning. I am extremely sorry that Commissioner Emery is unable to be here this afternoon to take up that matter with you. When that decision was handed down it was our first impression that the food department might just as well disband; that we had no jurisdiction over any of the packages that came into the State. We consulted the best legal advisors in Wisconsin and we find that the decision does not go as far as that. We find that the status of the original package, as we understand it, is exactly the same as it was before this decision was rendered. In other words, that it is not affected at all. There was one paragraph in the food statutes that

was affected. This paragraph specified that there shall be no other label on the package but the label demanded by our statutes, which was "glucose" and not "corn sirup." It was this section that was in conflict with the Federal regulations. So far as interstate commerce is concerned, under the present Federal regulation, when the term "corn sirup" appears on a package it must not be obliterated by any State law; but there is nothing to prevent a State, if it so desires, from having additional labels placed upon the package for the protection of its people. That is, we can, in addition to the term "corn sirup," if the legislature sees fit, have the term "glucose" placed on that label.

REPORTS OF CITY AND COUNTY DELEGATES.

MONTGOMERY, ALA.

By H. D. Long, *Inspector of Weights and Measures.*

Gentlemen, I am young on the floor, and only a city sealer. I am glad to have met these gentlemen, and I am sure, when I get back home and have a little talk with our people there, we will send a State representative next time.

NEW HAVEN, CONN.

By E. J. Maroney, *Sealer of Weights and Measures.*

Mr. President and gentlemen, our chief, Mr. Egan, gave you a brief synopsis of what the conditions are in our State and cities; and I think I can say without fear of contradiction that within the last 10 years we have made as great strides in the State of Connecticut as any State in the country. We have working there now the Mann net-weight package law, which was introduced by Congressman Mann, of Illinois, in the House at Washington and killed; and in most of the larger cities we have the model ordinances that were drafted by this bureau. In addition to that we have also a coal law which practically abolishes the ton, and the coal must be sold by the avoirdupois pound; tickets must be made out in duplicate, and when the sealer demands, must be made in triplicate—one to the seller, one to the buyer, and one to the sealer in charge of that particular district. It does not make any difference whether he is a State, county, or city sealer.

We also have another local ordinance in my city which compels all ice carts and coal wagons to carry a scale, irrespective of whether they sell by special agreement or not. I mean by "special agreement," for instance, if a woman sticks her head out of the window and says "Bring me 10 cents' worth of coal," or "10 cents' worth of ice," that is a special agreement; but if she says "25 pounds of coal," or "25 pounds of ice," it must be weighed. So that I think we are in a pretty fair condition.

As I said before, our chief is modest. There is a bill in the legislature which has gone through both houses, reported favorably by the committee, and which now needs the governor's signature to have it

become a law, wherein he is provided with five extra assistants and a total appropriation for running his department for two years, I think, of $52,000. We are a little small as a State, but we are getting along in first-rate shape, and I think we are what you might call progressive, not alone in our State but in our cities. I thank you, gentlemen.

BRIDGEPORT, CONN.

By D. Kelly, *Sealer of Weights and Measures.*

Mr. Chairman and gentlemen of the convention, I do not know that there is very much that I can say at this time which will interest you, as I am practically a new man in the business. When I entered upon my term of office last June I found that conditions were very bad in my city, which has a population of 105,000 people. For years we have had sealers there, but what they had done nobody knew anything about. We had a few old battered measures and a few old weights which were never certified as far as I can find out, and which needed resealing badly. Before I took office about $400 had been appropriated for my department for the year, including office expenses, transportation, and all of the contingent expenses of the office, which of course was entirely inadequate, but this year I have succeeded in inducing our board of apportionment, who appropriate the money for the fiscal year, to make a very liberal appropriation for me.

The people of the city seem to take my work with a great deal of favor. They seem to think it is something that was needed. It is a fact that very few people knew anything about the sealer or his duties. It was a dead issue, but they are now waking up. I am receiving all kinds of help from the people of the city of Bridgeport and I hope that in a short while I shall have a fairly good system in operation there.

I have had several cases in court and obtained convictions in every single case that I brought up.

At the present time I have a very good equipment—a very good office equipment in addition to a fair working equipment—and as I say, I have got a fair appropriation and expect to make some sort of a showing this year.

I do not know that I can say very much in addition to what my friend Maroney has said. Of course, Mr. Maroney has been in office a long time and has got his office work in good shape and is more conversant with the sealer's duties than I am.

In regard to the coal law I will say that perhaps he did not state it just exactly as it is. In regard to this agreement that he speaks of between the purchaser and the seller, he said that a woman could put her head out of the window and call for 10 cents' worth of coal. She can not do anything of the sort. The agreement has to be written, according to the State law, as I understand it. It is specified in the statutes that the agreement must be made in writing, and I think that is all I have to say about that. However, I will say that I have read the laws of the different States and I think that the Connecticut laws will compare very favorably so far as they have

gone; and it is remarkable when you come to think that it has all come along within the last two years. Of course, our net-package law is also operating very nicely.

I thank you, gentlemen, for your attention.

Mr. MARONEY. In order to enlighten Mr. Kelly, I will inform him that the question of special agreement has been tried out in the higher courts and it does not require anything in writing. Any purchaser can make a special agreement verbally at any time and have it hold in law. I think at one time we had to try it out in court, and that was the decision, that a special agreement can be made at any time for anything in bulk. It does not make any difference whether it is a special commodity, ice, or coal, or a chair, or a desk, or a suit of clothes.

Mr. KELLY. Just a word, if I may be permitted, I do not attempt to interpret the law, as I am not a lawyer and have had practically no legal training, but I will say that the law reads that the agreement shall be in writing. I remember that perfectly well—that our coal statute specifies writing. That is all I know about it. As to how far that would go in court, I do not know.

HARTFORD COUNTY, CONN.

By H. K. YOUNG, *Sealer of Weights and Measures.*

Mr. Chairman, and gentlemen of the convention, I do not think I can say anything more than Mr. Maroney has said about the State law.

I have gone through Hartford County and got it in pretty good shape at the present time. I have 3 city sealers and 7 town sealers working with me, so that I have 10 men whose work I have to look after.

WATERBURY, CONN.

By C. A. FINE, *Sealer of Weights and Measures.*

Gentlemen, I believe in the rule that speaking is silver and silence is gold, and as this is my first opportunity to be with you I shall be glad to listen to you gentlemen who are more familiar with the work.

Connecticut is just getting in shape on the question of weights and measures. We have been handicapped by our State legislature. However, we have a man who has taken the reins of responsibility on weights and measures—our superintendent, Mr. Thomas F. Egan. Mr. Egan has been working for the last few years reforming the weights and measures conditions. Only last week a law was passed by our State legislature, and I think it was in the Senate yesterday, to have Mr. Egan appoint a deputy superintendent of weights and measures and also inspectors of weights and measures. This will be the first time in the history of Connecticut that an office of that kind has been created. Connecticut not being a very large State, the business had been done by the cities in previous years. I do not want to criticise the work of the men who have been city sealers, but the system has not been what it ought to be, and what they have in other States.

I have hopes, when the law is enforced in Connecticut, that we shall have a good system and that the people at large will benefit by the supervision of our State and deputy superintendents of weights and measures.

Mr. ZIMMER (representing Chicago, Ill.). Mr. Chairman, I will give my time to Mr. Cluett, who will report for Chicago.

CHICAGO, ILL.

By W. F. CLUETT, *Chief Deputy Inspector of Weights and Measures.*

Mr. Chairman, and gentlemen, I want to say for the information of this convention, and also for the credit of the city of Chicago, that if the State of Illinois outside of Chicago is asleep, we are not. The State of Illinois itself does not have very good legislation on weights and measures, that we will admit; but the city of Chicago has as good a set of ordinances pertaining to weights and measures as there is in the United States, and we are still on the job. We have been doing business there for some few years. I would like to say that our inspections last year amounted to 104,000. We made 12,000 try outs, that is, purchases in stores, following up coal dealers, peddlers, ice men, etc., and reweighing and remeasuring their deliveries. We had 275 cases in court, with a total of $5,266 in fines assessed. That does not look as though we were asleep.

There are two ordinances in particular that we have put in force since the last conference. One is in regard to the sale of fruits and vegetables by weight or count in the absence of a contract to the contrary signed by both parties—that is, the buyer and the seller. That ordinance is working out very nicely; in fact, as you gentlemen interested in the business all know, the sale of bulky commodities by measure is by the most unfair standard that was ever invented. I will not go into that in detail, because you understand it anyway; and we have made a success of that weighing ordinance.

The other ordinance that I speak of is our strawberry-box ordinance. We have an ordinance for the sale of berries which provides that they must be in standard quarts, pints, or half pints. We are having very little trouble with that ordinance. It was put off for one year, as it was to have gone into effect January 1, 1912, but it did not go into effect until 1913, because the berry growers, manufacturers, and commission men petitioned the council that it would be unfair to make them comply with the ordinance at that date, as the boxes for that season had already been made up. So on that account the city council put off the enforcement of the ordinance for one year; but we have been enforcing it since the 1st of January. We are not having much trouble with it.

The other day I received a telephone communication from a commission man on South Water Street, telling us of a sad condition in Louisiana and Mississippi. It seems that they had a very large crop of strawberries down there and they ran out of their standard size boxes, so in order to have a market for them they wanted to use the smaller boxes, particularly for Chicago. They proposed to send them up to us, but mark them "short." We told

the commission man to telegraph back immediately and tell them to let the berries rot; that Chicago did not want them in short boxes.

We have an ice ordinance that we think is very good. It works out very well for the protection of the public. It demands that all ice sold in the city of Chicago shall be sold by avoirdupois weight and shall be weighed at the time of the delivery on a scale that has been tested and sealed by the inspector of weights and measures. The only way of getting out of that is by a special agreement to the contrary between the buyer and the seller, which would mean that if they wanted to make a contract to keep the box filled for so much a week they could do that; but otherwise it must be sold by weight.

I think I have covered about what we have done without going into the figures, which would become very monotonous.

There is one thing more that I want to say: Mr. Zimmer and myself have prepared a State bill on weights and measures for the State of Illinois, and while we are frank to admit that the bureau does not like that bill, I think it is only because it does not create a State office. I think that outside of that the provisions of the bill meet with the approval of the bureau. In the first place we make a statutory number of pounds per bushel for about 63 different articles. In the next place we have a provision in regard to the sale of firewood, prescribing how much wood shall constitute a cord. Now, we have something in the city of Chicago that I do not know whether you people have run across in your districts or not. We have some wood dealers that sell what they call a face cord. The only reason I can figure out for calling it a face cord is that thay have a lot of "face" to do it. A face cord means a cord of wood 8 feet long, 4 feet high, and 1 foot wide, or 6 inches wide—whatever the face is. We have had the provision put in the law that a cord must contain 128 cubic feet.

We also have another provision that gives the right to the sealer, either city, State, or county, to impound for evidence any faulty or incorrect scale or any commodity that is short of the weight that is represented, in order to produce it in court; and there is another provision that gives the courts the right to order destroyed any of this confiscated property or scales and measures that are not correct. Chicago is now working merely upon its police powers and its nerve, and we certainly have a lot of nerve. We have very little statutory backing, but we hope with the passage of this bill—and we have great hopes of having it passed at this session of the legislature—that Chicago will be able to do a little better than it has been doing, although we have been doing very well.

I thank you.

INDIANAPOLIS, IND.

By I. Wulfson, *Inspector of Weights and Measures.*

Mr. Chairman, and gentlemen, I am indeed delighted to be among men who stand for honest dealing and who seek the protection of the American consumer, the merchant, and the manufacturer. It is true that each State looks to its legislature to pass laws for the protection of its commonwealth; yet there are considerable difficulties

arising through lack of uniform legislation, and this is the reason that our work is so difficult; and it will always be difficult until Congress recognizes the importance of the matter and passes laws approved by this conference. I feel that Mr. Cluett just spoke for me, as the city ordinances he read sound as if they were adopted from the city of Indianapolis; or Indianapolis may have adopted them from Chicago; at any rate we have the same laws, the same ordinances, the same activities, the same results, and the same good will from the people and from the public press.

The public press is the messenger that brings the news to the public. Without the assistance of the public press, the officer in charge of a bureau of weights and measures is absolutely helpless. The press is entitled to know what is taking place on public premises, and the public should know whether their servants are doing their duty. But if you suppress those things, for fear that it will hurt your job, then this will surely hurt your job.

My friends, do not think for a moment that enforcing laws means "eye for eye," "tooth for tooth," "life for life." No! We are not living in ancient times. It is true that we have laws. What we have to use in enforcing the law is judgment. We must find the surroundings of every crime committed before we act. It is easy to put a poor dealer out of business; but it is not destruction, it is accomplishment, that we desire. Let the poor fellow stay in business and make him give full measure and full weight; that is all that is necessary.

We look upon this conference as a school of instruction. There are here a good many inspectors who may not have been long in office, yet they may have some idea which will be of great value to the experienced man. However practical we may be, we do not know all. Therefore, we come here to listen and to learn.

First, we find that we have to learn the nature of a commodity. I would like to give a premium to some one who can get 15 pounds of potatoes in a standard peck measure, when they are dry, caused by natural evaporation. The merchant heaps up his peck measure until it can not hold any more, and will not in many cases get 15 pounds in it. Are you going to arrest the merchant where there is no intention to defraud? Yet he is violating the law, and is giving you 13 pounds, perhaps, instead of 15 pounds to a peck. This is important for us to know, and in enforcing such a law we should use our judgment. A little practical experience will teach us not to be in a hurry to seize a merchant. So I say we must use judgment in enforcing our laws. Give the merchant a fair chance, as well as the consumer. And that is where you make your friends. The merchant is the backbone of our country. You must not forget that there are a good many honest merchants, and in my judgment there are perhaps 90 per cent of the people in the world who are honest. And to protect this honest merchant we must use the same judgment as when trying to protect the consumer against fraud.

In 1861, when the war broke out, the State of Indiana did not have any weights and measures law. Indiana did not have any inspectors of weights and measures. Indianapolis, however, did have a so-

called inspector of weights and measures. Then they abolished the office until 1906, when the office was reestablished, and the political plum of inspector was given to me. And the legislature and the governor have "pickeled" that plum for me by the tenure of office law.

I did not begin with the small fellow. I began with the largest corporation in the world, which was practicing fraud upon the purchasers. I found out that they were crooked, and I prosecuted them to the bitter end; and I won out, and compelled them to do right. Then I began to get the good will of the merchants of our city. When they began to find out that it was a benefit to the city of Indianapolis, I was welcome in every store, except those of the crooks. I am pleased to say that no offenders escaped punishment when they were found guilty. As a matter of fact, I always found the goods on them when I arrested them. I managed it some way or other to get the evidence, and I wish to tell you how I did it. I made myself a novelty by disguising myself. If it was necessary, I put on the uniform of a soldier. I went around from one place to another, lying behind ash barrels, standing behind kitchen doors; if necessary, associating with them, in order to detect the frauds. I have used all tactics to get the crooks; and so far, I have accomplished my purpose. All the criticism then disappeared; the public began to recognize that weights and measures conditions in Indianapolis had improved. Dishonest competitors who used to undersell the honest merchant are compelled to give full weight and measure. Crooked pedlers are reformed to-day owing to the punishment that was inflicted on them for their practices. That is the way I rounded them up; that is the way I made a success; that is the way you can make a success. Then the public will work in conjunction with you. For example, when I organized a housewife's protective association for the purpose of teaching the members that when purchasing commodities in stores and markets nothing but definite amounts should be called for, crooked dealers denounced me for organizing such an association. But the public press and the general public, recognizing the great movement, defied these protesting crooks, and this revolt kept up until the last legislature met in general assembly and amended the law of 1911; inserted the words "shall appoint" instead of the words "may appoint," and inserted also the words "The said inspector shall serve continuously during good behavior * * * and shall not be removed for any political reason." And now I leave it to the whole world, gentlemen, have not we got the best law of the United States in the State of Indiana?

EVANSVILLE, IND.

By J. C. Wallenmeyer, *Sealer of Weights and Measures.*

Mr. President, and gentlemen of this conference, in submitting a report for Evansville, I will state that during the first three months in office I condemned and confiscated over 1,200 scales, weights, and measures. During the year more than 12,250 scales, weights, and measures were condemned. In this number are included several

carloads of new metal and wooden dry measures, condemned as inaccurate and ordered to be returned by the jobbers to the manufacturers. A large number of coal and wagon scales were condemned, being entirely worn out, and the dealers have shown their willingness to comply with the requirements of the Indiana weights and measures law by installing new apparatus when requested to do so.

A number of investigations were made during the year to determine the shortage in various commodities. In our flour investigation we found almost all brands of flour short. One particular brand labeled "6 pounds, honest weight," was found to weigh only 4 pounds 13 ounces. We adopted a campaign of education, instead of prosecution, as we realized a prosecution meant a serious injury to the reputation of any business house, from which they could never entirely recover. This shortage in flour the millers attributed to the invisible loss in milling, claiming that wheat contained 12 to 18 per cent moisture, and a further loss by evaporation of 3 per cent after milling. The test for moisture in all kinds of grain was to take 100 grams of grain and boil same in 100 grams of Atlantic red engine oil—previously heated to expel all moisture—until the thermometer showed 212° F. The moisture in the wheat rises in the shape of steam in a coil, which is led through a cold water vat, thereby condensing the steam or vapor which drips into a glass graduate showing the exact amount of moisture in the grain. After calling a meeting of all millers shipping flour into Evansville and submitting the matter to the State commissioner of weights and measures, Dr. H. E. Barnard, of Indianapolis, a letter was sent to the millers demanding that flour be packed full net weight and stating that large shortages attributed to shrinkage would not be tolerated. All the millers replied stating that they would do as requested.

At the time of assuming my duties it was the common custom in all the seed stores to sell seeds, cranberries, lima beans, and many other dry commodities by liquid instead of dry measure. This practice was entirely abolished without any apparent ill will on the part of the dealers.

In the coal investigation dealers claimed a shortage of 20 to 40 bushels on each car. It was found that every flagman's shanty on every railroad in our vicinity was being heated with coal thrown from passing cars by brakemen or else taken from standing cars in railroad yards by the flagman. Brakemen were also seen to kick off generous chunks to coal pickers along the tracks.

In the meat investigation it was found that dealers had for years been charged the price of meat for the heavy wrapping paper and outside paraffined paper and beautiful blue cotton ribbon around each piece. This practice was abolished only on threats of prosecution. A new shortage in meats was found last week in one company's products which they claimed was due to shrinkage.

I quote the following letter which they sent to their agent at Evansville:

Chicago, Ill., May 6, 1913.

AGENT ——— ——— Co.

DEAR SIR: Referring to letter sent by city sealer at Evansville, Ind., Mr. J. C. Wallenmeyer, we suggest that you call on the city sealer when you are in Evansville,

and explain to him that our company is not violating the law of Indiana, nor the city ordinances of Evansville; that we give good full weight; that meat and meat-food products are of a perishable nature and that the oil and moisture in them begin to evaporate the moment the meat is packed; there is no preventing of this; that in the nature of things, it is impracticable to weigh meat and meat food products after they are packed; that sale is usually made at the time of packing, but it is usually made in Chicago and by the time it reaches Evansville the product has shrunk some; that there is no attempt or intention to deceive; that we state frankly on our invoices and delivery receipts that the product is sold at marked weights.

Yours, respectfully,

——— ———.

All dealers were instructed to deduct any shortage on meats, regardless of the claims of the packers that meat was weighed when packed.

On the foregoing items we have saved our dealers many thousands of dollars, and they expressed their gratitude for the service rendered by this department. In this way we have secured the cooperation of the Evansville Business Men's Association.

A small fruit and berry ordinance indorsed by the Bureau of Standards was passed by our city council with the aid of the Southern Indiana Fruit and Berry Growers Association, organized for the purpose of assisting the sealer in the enforcement of the law.

In the investigation of railroad weights, we found frcquent errors as a result of careless weighing done by brakemen who were unfamiliar as to conditions necessary for correct wcight, claiming they received no compensation for weighing and had to do it in a hurry.

The method of testing railroad track scales has been very crude. An open box car filled with scrap iron has been used by some roads with very inaccurate results. We now have in Indiana a 50,000-pound steel test car concentrated on a 6-foot 6-inch wheel base and having a central compartment containing 10,000 pounds of verified test weights. With this car it is possible to test each section of the scale up to 50,000 pounds capacity, which is equivalent to a load of 200,000 pounds on the scale, besides being able to locate and determine the crror, if any, in each section and make the rcquired adjustment. This car, on account of its shortness, is carried on mileage of 4 cents a mile instead of as freight. Mr. Winslow, at Terre Haute, also has a master scale to test the accuracy of this test car which is sensitive to 8 ounces, which I think our good friend Mr. Neale will admit is down to a fine point.

During the recent flood on the Ohio River it was my pleasure to be appointed by Mayor Heilman as aid to Capt. Naylor and Maj. Logan, of the Ninth Infantry, United States Army, in giving relief to flood refugees. Many shortages were found in emergency supplies bought quickly and wanted immediately. I have suggested to Maj. Normoyle, of the United States Quartermaster's Department, that in future flood relief work the various city sealers along the rivers be commissioned to weigh for the Government all supplies. As the present flood relief work cost the War Department $1,000,000, you can readily see that a shortage of only 5 per cent would amount to $50,000.

In closing I will state that the loss to citizens of Evansville, based on the percentage of condemned and confiscated scales, weights, and measures, on commodities sold by weight or measure, was found to be 3 cents daily per family, or $142,500 per year. We have eliminated practically all fraud, and by adopting a conservative policy in the enforcement of the law have been a protection both to the honest dealer and the purchasing public.

I thank you, gentlemen.

BALTIMORE, MD.

By G. A. Donaghue, *Chief Inspector of Weights and Measures.*

Mr. Chairman and gentlemen, I have been looking forward to this conference with a great deal of pleasure. My predecessor, Mr. Thomas, who was superintendent of weights and measures last year, came back to Baltimore with such glowing reports of the last conference that I was naturally anxious to be present at this one.

Baltimore is handicapped at the present time by not having any State supervision, but I hope that in January, 1914, we shall be able to interest the governor and the State legislature to the extent that a State superintendent will be appointed, and, working in unison, I think Maryland and Baltimore will take their proper places among the States and cities of the Union.

Mr. Thomas, who was chief inspector last year, went thoroughly into the matter—the work of Baltimore—so I do not think that it will be necessary for me to go into detail. I have only been superintendent of Baltimore city for the last 10 or 12 months. Previous to that time I was one of the inspectors on the street. I held that position for about seven years. The laws of Baltimore are up to date. We have passed a number of ordinances which are a combination of the city ordinance which some of you gentlemen brought up last year and the New York City ordinance described by Dr. Reichmann, and with this combination we feel that we are in very good shape.

I came up here, gentlemen, to get information to take back with me and put into effect rather than to give you information. I thank you.

BOSTON, MASS.

By C. B. Woolley, *Sealer of Weights and Measures.*

Mr. Chairman, officers and members of the Eighth Annual Conference on the Weights and Measures of the United States and visiting sealers, one year ago, at about the time this convention was about to convene, and after I had been looking forward with pleasurable anticipation at the prospect of being with you and of being part of you, stern Fate ordained otherwise, and instead of fraternizing with my fellow sealers, I put in a dreary month coaxing a refractory ligament in one of my legs to behave and allow that very useful part of my anatomy to perform its normal functions.

I mention this incident not to dwell upon my afflictions, but to emphasize the very good excuse I had for not being with you one

year ago and also to impress upon you the great pleasure it gives me to be with you to-day—sound in limb—and eager to absorb some of the useful, I might say indispensable, information which these annual interchanges of experiences and methods are bound to impart.

It may be well at this point to say that before I left Boston I had a very pleasant letter from the mayor of our great city—every one knows our mayor, the Hon. John F. Fitzgerald, the omnipresent, zealous, untiring booster and boomer of our great city—in which he, with his usual cordiality, authorized me to represent the city of Boston and convey his greetings to this great and exceedingly important body. Mr. Fitzgerald is now, or was a few days ago, in South America, proclaiming with his customary strenuosity the cause he loves so well—a better, bigger, and busier Boston.

Incidentally the mayor instructed me to note carefully the proceedings of the convention, in view of further perfecting the Boston department to that state of efficiency where it will rank in importance first among the departments of weights and measures in the United States.

I wish also to state, incident to my not being present here last year, that, as I understand, I was ably represented by my chief deputy, Mr. Sweeney, who told me in glowing terms of the courtesies that he received at the hands of the officers of the Bureau of Standards and the valuable information which he obtained. But I must stop this generalizing and if you will bear with me for a few moments I will tell you something of the Boston sealers methods and experiences.

Prior to 1907 the personnel of the department was not marked. Influences which were not conducive to proper discipline and were against the proper administration of the office then prevailed. In 1907 a State commissioner of weights and measures was appointed, and I know that when his excellency the governor made that appointment he performed a signal service to the Commonwealth of Massachusetts.

I will only touch upon the work of my department, for I think that the officers of the bureau are now well informed of the healthy growth of the Boston department, which in a great measure is due to their suggestions and to the cooperation of the State commissioner, and I feel justified in saying that Boston now has one of the best departments in this country. Perhaps my friend Wulfson from Indianapolis has one just as good, but he has got "to go some" to keep in the running.

One thing was suggested to me by Mr. Wulfson's speech, and that was in reference to prosecutions. I have had a great many prosecutions in the past year and I think that we, as sealers, should certainly strive to temper our zeal with justice. When we detect, as we have reason to believe, a violation of the law, we should investigate thoroughly the merchant's character and the conditions of the sale which brought about the irregularity, and ascertain, if possible, whether there was any intent to defraud before making the prosecution. Why, gentlemen, the largest asset that a man can have in this life is an unsullied reputation. Take that away from him unjustly and you have taken that which you can never return. And so I feel that

with our laudable zeal to prosecute the willful offenders, we should be just as anxious to protect the reputation of the merchants who may have been negligent and careless, but not in the least degree criminal.

I would like to tell you of my first case in court. It was in Massachusetts prior to the time that the sealers were included in the civil-service list, those holding appointment in cities or towns of more than 10,000 inhabitants. Our term of office was at that time a year, and with a change of administration we were through. You all know the value of experience and that it is necessary for the best interests of our departments to have men of considerable experience retained in office if found worthy. The case in question was quite a serious violation of law, and I applied to the court and obtained a summons. As soon as the summons was issued, an alderman rushed into my office and said, "What are you doing with Smith? Why, he is a good honest fellow; he has been in business 15 years. Not only that, he is one of my constituents." "Why," I said, "You are a little late, there is a summons for that fellow." "Well," he said, "you serve that summons and I will have your head." At that time we had no protection whatever. However, the case came to trial, and on entering the court room I found the chairman of the board of aldermen on the bench, as associate judge. The judge being indisposed, he was the presiding officer. The case went on—as I thought—to my advantage; I was impressed with the certainty that we would win the case, and that it would be a heavy fine and perhaps imprisonment; when in rushed the aforesaid alderman, approached the judge and whispered in his ear. The judge asked one or more questions and said, "I will place this case on file."

That decision and other decisions like it had the effect of lessening the zeal of the sealer and his deputies, not because they were any less anxious to see justice prevail, but such a discouraging outcome of their efforts to protect the public could have no other result. After once having been placed on a basis where political influences could not be used to thwart the ends of justice, our activities commenced in earnest.

Last year we had 75 prosecutions, while the year before our convictions were 99. This is gratifying evidence that the temptation to violate the laws to enforce honest weights and measures is growing less year by year and a wholesome respect for square dealing pervades the whole community.

In closing I wish to say that great credit is due to the officers of this bureau, as well as to the State commissioners, for their cooperation; and if you progress in the future as you have in the past, you will continue to receive the well-merited approbation of the great buying public, and that means every family in the United States.

It is not too much to hope that the very great influence of this far-reaching organization will lend itself to furthering the cause of civil service, which we must acknowledge—the selfish as well as the unselfish—is doing so much to put our municipalities on a plane of business, pure and simple.

CAMBRIDGE, MASS.

By H. H. Healey, *Sealer of Weights and Measures.*

Mr. Chairman and gentlemen, I come from a city of 110,000 people. We have one sealer and three deputies, and, not satisfied with that and feeling the importance of the work, have asked for still more help. My great hobby in this work is publicity. I believe that we can come here year after year and suggest good laws, and try to get them enacted by our legislatures, but until we mold public opinion to the extent that the public will demand those laws, their progress will be very slow.

In our city we have given several lectures on the weights-and-measures question, with stereoptican views of different types of scales and different methods of defrauding the public. I believe that if this were made nation-wide, Congress would take more interest in weights-and-measures questions, and we would then improve rapidly. I thank you.

SALEM, MASS.

By G. L. Day, *Sealer of Weights and Measures.*

Mr. Chairman and gentlemen, the worst violators of the laws in Massachusetts are the big packers. I had a short-weight case last year against one of them. I made the complaint against the manager. The judge would not allow a criminal record against him, but said I must bring in the corporation, so I made a new complaint and brought in the entire company, under the laws of the State of Maine.

Their lawyers said they were incorporated under the laws of the State of Maine and the State of Illinois, and had 40 partnerships and that I had not proven the one in Salem to be the Maine corporation, and the case was thrown out.

This year I thought I would thrash that out, but have not succeeded as yet.

I went to the attorney general's office for information, and Mr. Power, of that office, found that the company was incorporated under the laws of the State of Maine to do business in Massachusetts, with headquarters in Boston, but there was nothing to prove that they did business in Salem, Lynn, or any other cities in the State.

Mr. Power told me to summon every big man of the corporation living in Massachusetts to court, and he thought some of them would tell the truth. I expect this case to come up next week. I thank you.

GRAND RAPIDS, MICH.

By J. J. Byrne, *Sealer of Weights and Measures.*

Mr. Chairman and brother delegates, it affords me great pleasure to meet with you and the accomodating officers of the bureau once more.

Mr. Holbrook told you that Michigan was dormant on State laws. I will assure you that Grand Rapids is not. We have a set of city

ordinances there that we can do business under and get along very nicely. As far as the State law is concerned, it was enacted by the present legislature this winter, was just signed by the governor the other day, and I procured a copy about an hour before going to the train. While the bill was drafted after the model law of the bureau here, it was, to use the slang expression, pretty well shot to pieces before it got to the governor. However, it is a step in the right direction, and I think in the future we can get something that is worth while. Gentlemen, I thank you.

ST. JOSEPH, MO.

By E. M. GILPIN, *License Inspector.*

Mr. Chairman and gentlemen, I have not much to tell you, because we are thoroughly new in this line in our city. The State affords us no help, and there is no State law on weights and measures. We have only been in operation about six months working under a city ordinance, but are getting along very nicely at this time, although it is pretty hard to do very much without some help from the State. The legislature so far has given us no help.

We had a bill before the last legislature, asking them to give our honorable mayor and city council the power to pass an ordinance doing away with the dry measure altogether, and sell all commodities by weight; but this was turned down. That is about all I have to say at this time. I thank you, gentlemen.

BAYONNE, N. J.

By H. MAINHARD, *Superintendent of Weights and Measures.*

Mr. Chairman and gentlemen, up to two years ago, about May, 1911, to be exact, we of New Jersey had practically no State organization. About that time President Woodrow Wilson, then governor of New Jersey, selected a gentleman to head our State department. The appointment has since proven a splendid one. The gentleman appointed made an excellent head of the department and to him we owe our fine State organization. I refer to Mr. W. L. Waldron, our State superintendent. Under Mr. Waldron, we of New Jersey organized every municipality in the State. We formed a State organization with Mr. Waldron at the head and since then have done, I believe, the best work in the Union. Through the efforts of our organization, we succeeded in having beneficial legislation passed by the State legislature. Some of the laws we inaugurated have been adopted in other States. Our sealing system is considered the best adopted in this country. As for my city, Bayonne, it has the reputation of being one of the best regulated in New Jersey. We are complying with every law and assisting to the fullest extent our State organization.

ESSEX COUNTY, N. J.

By A. Harris, *Superintendent of Weights and Measures.*

Mr. Chairman and gentlemen, I am an expert listener, but a very poor speaker; but I will say, as Mr. Mainhard has just stated, that when you have a man like Wm. L. Waldron, our State superintendent, behind you, no department can help but make good.

In one of our short-weight coal cases which was tried before our Hon. Judge Wm. P. Martin, who is a friend of all honest people and an enemy to crooks, a jury brought in a verdict against the defendant in seven minutes, and his honor imposed upon the defending coal dealer a fine of $1,000 and a term of six months in the penitentiary, which I believe is the largest penalty imposed upon anybody giving short weight and measure, and since then we are unable to find any coal being delivered short weight; so you see, gentlemen, that with the cooperation of the State department on one side, and the fearless and heavy hand of the law ready to come down on the dishonest merchant on the other hand, we are able to keep things in good condition; and I can assure you that Essex County is in better condition to-day than ever before. I thank you.

UNION COUNTY, N. J.

By A. W. Schwartz, *Superintendent of Weights and Measures.*

Mr. Chairman and gentlemen, we have placed New Jersey on the map so far as weights and measures are concerned. In looking over the first page of the program I notice it says that the object of extending the invitations to the officials of weights and measures departments throughout the United States was that they might learn from their fellow workers what was being done and how it was being done, and give the conference the benefit of their experience, etc.; and that it was believed that this would result in some good to the entire United States of America so far as weights and measures were concerned. Now in our State, as you have already learned from Mr. Waldron's report this morning, we have made considerable progress along the line of legislation, and we believe, as some of the gentlemen who preceded me have said, in publicity. Of course our department is in its infancy so far as years are concerned, our law having been passed in 1911, and we believe in a great deal of publicity and also in a campaign of education. The department started out, not with the idea of persecuting or prosecuting, but rather to get the merchant and the consumer to understand the value of a department of weights and measures. A great deal of diplomacy was used, some good common sense, and some good judgment in making our inspections and tours through the various counties and municipalities of the State, so that we had the public with us from the beginning; and what we ask from our legislature we can pretty nearly get.

Our State association was organized a year ago; it just had its annual convention in the city of Newark on the 30th of April. We have a legislative committee appointed, and that committee, with the

superintendent of the State department, Mr. Waldron, looks after whatever legislation we think is beneficial to the people of the State regarding weights and measures. We meet a number of times during the year to confer, and then have bills drawn up and introduced and attempt to have them enacted into law.

Now, if you will just bear with me for a moment—this is the first chance I have had to say anything—I will touch upon a few little things that confront us. In this campaign of publicity and education in our State, we have inaugurated a plan of exhibits throughout the various counties and municipalities. If there is an industrial exposition in a town, we get space there, and we put on an exhibit to show the people just exactly what they can expect from dishonest dealers. Not only that, but we show in connection with that honest weights, measures, and scales, and show the contrast, and give them pointers as to how to protect themselves. At the interstate fair at Trenton—that is one of the big features of New Jersey each year—the State department had its exhibit and had different apparatus from all over the State on exhibition; and the crowds that were around that booth during the six days of the fair were remarkable. It was surprising to see the interest that was manifested by the people of the State. That is one of the ways of launching your campaign of education, getting your people interested, and getting them with you.

Now, I think New Jersey was the cause of the parcel-post scales agitation. I think that in the county of Union, from which I come, in the city of Elizabeth, Mr. Bender was the first to discover that one certain make of parcel-post 20-pound scales was not accurate, and he was a little in doubt as to what course to pursue. We took it up with the State department, and through the department we obtained authority to go along the line and test out all the apparatus in the State, which we did. Every post office was visited, and we were received very courteously by the postmasters. All of the equipment was inspected and reports made and sent to the State department, and the State department in turn took it up with the postal authorities.

Now, probably some of you gentlemen have in your cities chicken markets where they sell live poultry. We have quite a number of these depots in Newark, Jersey City, Bayonne, Elizabeth, Camden, Trenton, and some of the other large cities; and we have just discovered a scheme whereby the weight of the poultry is increased—at least we think it is a discovery; probably it is old to some of you men who have had experience in this line.

Crated poultry is brought to the market, and the merchants starve them for three or four days or longer; then they feed them on a soft mash with plenty of salt in it and finally allow them to fill up on water. We have found that a 4-pound chicken that was weighed up before this process was adopted, weighed 5½ pounds when it was so treated, the increased weight being brought about simply by the absorption of water. What first called our attention to the matter was that some merchants were selling poultry at 22 cents a pound while their competitors down the street were selling at 16 cents a pound and the question arose how can these men afford to do it when the wholesale price was 18 cents a pound? Well, this pound and a

half at 16 cents makes up that difference. For a 4-pound chicken, before treatment, at 22 cents a pound would be 88 cents, and a 5½-pound chicken, after treatment, at 16 cents a pound would also bring 88 cents.

Now, about our difficulty in coal. We have our coal delivered sometimes in bulk, but mostly in bags, and we find that we have a great many short bags. The bag is supposed to weigh 100 pounds when filled, but a lot of them run only 85 pounds to the bag. We have had a great deal of difficulty, particularly in the suburbs, where there are no big wagon scales to drive a wagon on and get it weighed, so we have adopted the following method:

We have a tripod with a hook underneath it, and a special double-faced spring scale of 200 pounds' capacity. The tripod may be strapped up, there is a special case for the scale, and with this equipment the sealers start out and hold up loads of coal; demand and obtain the delivery ticket; go to the place of destination and set up the apparatus where the coal is to be delivered, and then weigh up every bag of coal as it goes into the chute or cellar. If the load is in bulk it is weighed in a special bag carried by the sealer. We get the gross weight of the coal and the bags, deduct the tare of the bags, and thus obtain the actual net weight of the coal delivered. It is no longer necessary to take the load back to the public scales, which would in some cases make it necessary to drive 3 or 4 miles. We have reached a point where we have very little difficulty along this line, because it is realized that we are watching them.

I am very glad to be here again this year, because I think these conferences are a very good thing, and I hope to be with you again.

NEW YORK, N. Y.

By F. H. Tighe, *Deputy Commissioner of Weights and Measures.*

Mr. President and gentlemen, I am directed by Commissioner John L. Walsh, of the mayor's bureau of weights and measures of the city of New York, to appear here before you to-day to express to you his sincere regrets for his failure to be with you in conference assembled. He has, however, prepared a special paper which I will read when that number on the program is reached.

CLEVELAND, OHIO

By W. Q. Radcliff, *Sealer of Weights and Measures.*

Mr. Chairman, I will make my talk shorter than the applause. Ohio has a good governor. Cleveland has a good mayor. Ohio has a good dairy and food commissioner, who is also State sealer. We keep busy in Cleveland and do things right.

RICHMOND, VA.

By T. W. Joseph, *Sealer of Weights and Measures.*

Gentlemen, it is with great pleasure that I am back here on the second visit, as I have looked forward to meeting my friends that

I met 10 or 12 months ago, but I am not here to make you an address this morning.

I am glad to say that we are still alive and progressing slowly. I hope under the present management of the city of Richmond that the department of weights and measures will be a greater success in the city of Richmond than it has been for years.

PETERSBURG, VA.

By A. S. JOHNSON, *Sealer of Weights and Measures.*

Mr. Chairman, I find that a large majority of the merchants of my city are glad to see me, and a few are not. They also recognize the importance of some one attending to the weights and measures.

I am working at a great disadvantage. I am out only twice a year, and also am working under the fee system. I hope this system will soon be done away with, and that we shall have daily inspections. Since I have been working I have found a great many short weights and measures.

SEATTLE, WASH.

By A. W. RINEHART, *Chief Inspector of Weights and Measures.*

Mr. President, I came about 2,500 miles to attend this conference, and I have been trying to figure out what particular portions of our ordinance might be of interest to the various sealers that are here, and what differences, if any, exists between the other ordinances touched upon this afternoon and our own.

Under our city ordinance the superintendent has the power to regulate the types of scales to be used in the city and to condemn any type which upon test proves unreliable and inaccurate, and from the beginning of the enforcement of the ordinance we have condemned all family types of scales for use in trade, and the result has been of great benefit to the whole city and has resulted in a far superior lot of scales in the market places and small stores.

A notable difference between our city and the eastern city is the absence of the dry measure, we having to deal exclusively with scales and liquid measure; every commodity is either sold by weight or liquid measure.

On our way to Washington we visited St. Paul, Minneapolis, and Milwaukee and noticed the many kinds of dry measures in use, and we came to doubt the possibility of coming within 10 per cent as close with the dry measure as with the weight. We think the sale by weight of all dry commodties is much more fair both to the dealer and the consumer than the sale by measure.

One of the difficulties that we have had since our ordinance has been in force is trying to teach the inspectors, as well as ourselves, the difference between moral wrong and legal wrong, and trying to find just what our legal rights were under the law. We find the attorneys hold different views regarding the legality of some portions of our ordinance, and we have had to appeal to the courts for relief in some cases.

One section of our ordinance, section 11, prescribes that all commodities that are ordinarily and usually sold by weight or measure, if they are put in containers, must be marked with the true net weight, and the question of the legality of this section has just been passed upon by the supreme court of our State in the case of Seattle *v.* Goldsmith, and this is a case that I want to discuss to-morrow with reference to the matter of shrinkage.

We also have a case at this time against a large packing company involving the very question that came up to-day—that is, whether they have a right to plead shrinkage as a defense against selling on the basis of net weight.

We have also had another case that one of the gentlemen spoke of this afternoon with reference to the 25 cents' worth of potatoes; that case has been decided by our superior court (not the supreme court) and the court held that if a person asked for 25 cents' worth of potatoes the dealer was bound to deliver the number of pounds of potatoes as would represent 25 cents' worth at the ordinary market price of potatoes; held that that was not a special agreement and that the dealer had no right to sell a "bucket of potatoes" under our ordinance requiring the sale upon the basis of net weight.

I might say, with reference to the Wisconsin case mentioned by Mr. Downing and the Washington case, that we have already had notice of an application for a rehearing in the latter upon the ground that the former has been decided more recently. This case declared that a container that leaves one State and goes into another is an interstate package up to the time it reaches the consumer, and it is claimed that as that phase of the question was not touched upon our case should now be considered from that angle. At the present time the Goldsmith case, in my judgment, stands out as the most important case, in so far as the consumer is concerned, that has ever been decided in the United States; in brief, our supreme court decides that we must start with the consumer and work backward to the packer instead of starting with the packer and working forward to the consumer; it in effect says that the manufacturer who puts up the package knows more than anyone else what the shrinkage is going to be in that package, and he must make allowance for that shrinkage by increasing the size of his package so that the ultimate consumer will get 16 ounces for the pound; and that if he does not know what that shrinkage is going to be he must keep it on the shelf till he finds out, thus upholding the contention of the city and the ordinance which requires the sale upon the basis of the true net weight. I thank you.

MILWAUKEE, WIS.

By W. F. STEINEL, *Deputy Sealer of Weights and Measures.*

Mr. Chairman, and gentlemen, we have had a weights and measures ordinance in force during the past four years. About five years ago, Mr. Holbrook, of the Bureau of Standards, made a tour of inspection in our city and his report showed it to be one of the worst cities in regard to weights and measures in the United States. Our department was created in 1909 with a sealer and two deputies, and our

force has been increased from time to time until we now have six deputies at work.

I can report that we have things in pretty good shape in Milwaukee at the present time and that the general conditions are improving in our city from year to year. Our report will show that where we found only 50 per cent of the scales in use correct in 1910, and 69 per cent in 1911, the percentage of correct scales in 1912 was 88.5 per cent.

A corresponding improvement in the accuracy of the weights and measures in use in the city was also found. Our try-out system also shows a vast improvement over previous years, 93 per cent of the purchases made by this department being found correct.

During the year 1912 we tested 66,000 scales, weights, and measures in Milwaukee and tried out 16,913 places of business, and had 49 prosecutions. We have probably set the initiative in prosecuting for shortages on one commodity, and that is beer. During the past year we have brought three cases into court on short beer barrels and have secured convictions in all of them. We found barrels that were from 2 to 4 gallons short of the standard barrel in Wisconsin. A large percentage of the barrels in use in our city were found short, and you can figure it out for yourselves and you will bear me out that this shortage is probably greater and will amount to more in dollars and cents than any commodity sold in this city when you stop to consider that we produce 5,000,000 barrels annually.

It was quite easy to find violations of this kind, and after prosecuting three cases we thought it best to help the brewers comply with the law by giving them time to recooper their short barrels, and all of them are now trying to do so. My friend, Mr. Downing, mentioned the fact this afternoon that we were changing the capacity of the liquid barrel in Wisconsin from 31½ gallons to 31 gallons. I would like to say in explanation that the reason for this is that in every case we took into court the point was raised that the Wisconsin standard was in conflict with the revenue barrel which calls for $1 revenue tax for every 31 gallons of beer.

The brewers have maintained that if they sold barrels that were up to the Wisconsin standard they would be required to pay an additional tax on each barrel, and in order to avoid any further controversy on the subject we have decided to be in uniformity with the revenue barrel.

The SECRETARY. Gentlemen, I would like to make a motion that we adjourn.

The motion was seconded and carried. Accordingly, at 4.40 p. m., the meeting adjourned.

THIRD SESSION (MORNING OF THURSDAY, MAY 15, 1913).

The conference reassembled at 10.30 a. m.

The CHAIRMAN. The Secretary has an announcement to read.

The SECRETARY. We have a notice here from the Secretary of Commerce that he will meet the delegates at the White House at 2.30 at the east entrance. The reception will take place in the East Room.

Mr. NEALE. Mr. President, while there are announcements going on, I would like to state that Dr. F. Reichmann, superintendent of weights and measures of New York State, has written me a personal letter requesting me to express his regrets to this conference that he can not be with us. He further says that, fearing he had left out some body here in the notice of the State weights and measures conference in Buffalo, May 20–23, the invitation is extended to all who are here, and that all who wish to go should get into communication by wire with C. J. Quinn, 44 West Seneca Street, Buffalo, N. Y., or the Hotel Lafayette.

The CHAIRMAN. You have heard the Secretary's announcement and the announcement of Mr. Neale. Let me say, in connection with the latter, that anything that the various delegates can do to assist in this movement in the States is a very worthy thing to do, and I would suggest that all take part in this who possibly can.

The SECRETARY. Mr. Chairman, I would like to have Mr. Henry Houck, the secretary of internal affairs of the State of Pennsylvania, who has charge of the weights and measures work in that State, make a few remarks.

The CHAIRMAN. If there is no objection, that will be in order.

Mr. HOUCK. Gentlemen, this is very sudden. I am very sorry I missed you yesterday but I am glad to be here and to see the increased interest in this great work in which you are all engaged. My own State moves rather slowly, but when we do move we move in the right direction. We are working hard to get the legislation that we ought to have in Pennsylvania. We are not getting exactly what we want, but with the bills now pending in the legislature, if they are passed, and we are fortunate enough to have them signed by the governor, we will be in very good shape. The interest there is growing, and under the management of our Mr. Sweeney I feel sure that good results are going to come in our great State in a very short time.

Mr. FINE. Mr. Chairman, I desire to call the attention of the conference to one matter of great importance. I do not know how other States are, but in Connecticut our State police department will have the sole supervision of the weights and measures. If it is in order at the present time, I would like to say that my hope and my belief is that the day will come when, no matter how large or how small the town or city is, every city in the United States will be free from the

influence of political parties. When we see that adopted, Mr. Chairman, the Nation at large will benefit by it, and the work will be done in a proper manner. I deem it my duty to make the suggestion that every man go home and urge upon his governor or his mayor or his legislature that every sealer—it matters not who he may be—should be independent of political parties. I believe, Mr. Chairman and gentlemen, that under such conditions the work will be carried out in a more efficient manner, and I believe I am supported in my opinion by the experience of the past.

The CHAIRMAN. There is one thing we have found in this, as well as in other lines of the bureau's work, and that is that the work of the city sealer is in close contact with the work of the General Government; and if the General Government is prescribing and favoring the best regulations and standardizing regulations or ordinances, it is going to be very difficult to introduce politics into that very important matter. We find this true in many lines outside of weights and measures.

Mr. KEACH. May I ask if you would be in favor of a national law unifying all the States, this being the paramount law to govern, and every State to be prohibited from making any law contrary to the same; and also, in conjunction with that, to put all inspectors upon a civil-service basis, in order to protect them from political influence?

The CHAIRMAN. I think you ought to put your question the other way: Is there anyone who would object to such a thing? If there is anyone who would object to that, very well.

Mr. KEACH. I wanted to get the question before the chairman himself and try to get his idea.

The CHAIRMAN. Well, I do not object to it. In fact, the bureau has been trying ever since we have been in existence to get through national legislation upon those matters in which uniformity is so imperative that it is impossible for the States to efficiently regulate the matter, and the thing that stands in the way is the fact that so many Representatives in Congress feel that a large part of this is a local matter and belongs to the States. You have no idea of the opposition that is met in that way. So, after all, it is a matter of education, and it is for you people to educate your Congressmen along those lines. In certain sections of the country those State-rights doctrines are very deeply embedded, by tradition and by nature as well, so that it is hard to break away. But we are doing it. We are breaking away from it right along, and we are tending more and more toward centralization in those things, especially as to the vital points. It will readily be conceded that various localities would want the details modified, but as to the vital points, they should be uniform; there is no question about it.

Mr. FINE. I would like to ask if this conference will go on record and send a copy of these proceedings to our governors, or to the proper authorities, and recommend to each State the adoption of a merit system for the sealers. I believe you can get a better quality of man in that way. You know, gentlemen, when a man has been a sealer for two years or four years and another political party comes into power, that this good man goes out. It is not a matter of losing

a political position, but the people suffer under such a system. Now, I sincerely hope that it will be possible to have the United States Government take hold of this matter. It is a question, gentlemen, of better government; and if you agree with me let each of you go on record and send out copies to every State in the Union and recommend those improvements and those ideas to the governors.

The CHAIRMAN. Let me suggest to you—our time is short and perhaps we can save a little time—that the bureau would be very glad to send out such suggestion—it is in constant communication with the governors and is constantly sending out literature—if it is the wish of the meeting to take some formal action in regard to this point. I think it is well worth considering. It would not be at all out of place to go on record that in the various States these offices should be free from politics and placed on a civil-service basis. Is that your desire? If so, we will later appoint a committee and handle it in that way.

Mr. DOWNING. Mr. Chairman, it will be necessary some time before this convention adjourns to elect officers, and I wish, in order to facilitate matters, to move at this time that a nominating committee of three be appointed by the chair.

(The motion was seconded and agreed to.)

The CHAIRMAN. I will appoint Mr. Downing, Mr. Willett, and Mr. Schwartz as the nominating committee.

CONTENT OF CONTAINER LAW.[1]

By Dr. F. REICHMANN, *Superintendent of Weights and Measures, State of New York.*

At the last conference I outlined briefly what has been the basis of weights and measures work in the State of New York; that the essentials of specification of any commodity are its quantity and its quality and that the ulterior object of all weights and measures regulation must be that the first element of such specification, namely, the quantity element, be known. All other features of weights and measures or standardization and all the work of the testing of apparatus to know whether it is correct or was correctly launched, whether it is of approved type, or whether it is correctly used, are to this ultimate end, that the quantity delivered be of a definite and known amount within reasonable limits. If such is not the ultimate end, then all so-called weights and measures work is futile. Perhaps it is because the work has not been considered from an economic standpoint and only from the purely instrumental side that so little has been done in the United States and why the Federal Government has practically done nothing. While there have always been standards of weights and measures in the possession of the Federal Government and which standards by the Constitution are a matter of Federal control, yet, aside from testing some instruments for Government work and in the last few years testing some standards, no broad view of weights and measures has ever been taken by any Federal Government department except by the Bureau of Chemistry of the Depart-

[1] Read by title.

ment of Agriculture, which early recognized the essentials of specification in the first drafts and recommendations for a national pure food law. I think, however, that the matter of necessity of representation of specification in the dealings of one person with another or in business transactions was lost sight of and the quantity elements were disregarded, because the pure food law was enacted largely as a matter of health and not as a matter of definiteness of specification in business transactions.

I stated at previous conferences that one of the definite policies of the New York State Weights and Measures Department was that a correct representation of the quantity delivered would be of benefit to the manufacturer, producer, distributor, and consumer; that definiteness of representation and correctness should be insisted on at the launching and should apply to all transactions and to the sale or dealings in all commodities. It is a matter of chronological record that the awakening of the importance of weights and measures in other States and in the Federal Government itself came only with the work that is being done in New York State. Unfortunately, most legislative bodies in other States and persons supposed to be interested in weights and measures have always clung to food products. Be fair to all. While food products are important, other commodities are often just as much of a necessity and in many instances are not as easily or readily checked by the person purchasing them.

The views of those advocating that containers be marked may be put in two classes: First, those who believe that all commodities shall be sold only in certain definite-sized containers and no others and these marked; second, those who believe that containers should be marked but that the sizes of containers that may be used should not be restricted. These two views will be taken up separately.

1. According to the first view, liquid commodities should only be sold by gills, pints, quarts, gallons; dry commodities only by bushels, half bushels, pecks, dry quarts, and dry pints; and commodities usually sold by weight should be sold only by pounds, half pounds, quarter pounds, eighth pounds, and sixteenths pounds and fractional parts divisible by two and by multiples of the pound. Holders of such a view believe that it is right to require by legislation that a person can only sell or purchase a certain amount irrespective of whether they need or want that amount. It is very easy to see that such a process would be productive of waste and would be hampering individual effort if not curtailing the liberty or rights of the individual. My personal opinion is that such a view so restricting the size of containers that could be used always emanates from pure theorists or would-be reformers who have no idea of ordinary commercial transactions. Some of those who hold such views would extend the size of measures so as to include even larger containers, such as packing boxes or shipping receptacles. Wherever possible ordinary commercial associations tend to standardize as far as possible shipping containers, simply as a matter of conservation of value of the shipping container and as a matter of transportation facility. A manufacturing concern must necessarily, especially when dealing with other than food products, use various-sized shipping receptacles.

A modification of this view is that held by some who believe that all commodities should be sold only by weight and in no other way. Such again is the view of those who have not looked into the method of producing either natural products or manufactured products. Among those who hold such views are also found two elements: First, the element of impossible enforcement, and second, the shirking or shifting of responsibility of enforcement. This is illustrated in the barrel law which was introduced in the last Congress and which the introducer informed me was drawn by the Bureau of Standards. This bill in essence stated that any weights and measures official finding any barrel which contains fruit should confiscate the barrel, but should not disturb the contents. The bill actually stated "destroy," but to take the staves away from a barrel of any kind of a fruit would necessarily so disturb the fruit that it would be destroyed. It would have been fairer and sincerer if legislation had been proposed to stop the launching of other barrels than those defined as containing a certain multiple of capacity standards or by its linear dimensions. In this bill the responsibility of enforcement was shifted from a Federal bureau which sought to establish the regulation. This is simply given as one of many illustrations of such legislation which is proposed. Generally such legislation establishing certain standard packages is useless, and where such legislation is enacted it should only be enacted after commercial custom, or, if you will, trade custom, has found that it is the only practical solution. Where a trade custom is really a trade custom it should be legalized to prevent the few who may be inclined to be unscrupulous to take advantage. The decrying of all trade custom is vicious. It is a matter of universal trade custom that milk sold in retail is sold by standard liquid measure, such as quarts, pints, and gallons, but it would be inefficient and unjust to require that all milk be only sold by such measure, because, as a matter of fact, milk in large transactions is almost always sold by definite specification of weight, fixing the price by the percentage of milk fats.

2. We now come to the second view. The second view maintains that a definite representation in easily understood, and plain terms shall be made of how much is sold, of whatever the commodity, and that irrespective of the size or shape of the container that if such a definite representation is made there is no element of fraud. Consequently no one is injured, and it is a fair, equitable transaction, and leaves the individual free to choose. This view in nowise interferes with existing standards of package, in nowise injures the capital invested in automatic machinery, but does enable the purchaser to use discretion, and does allow the producer to know which is fair and which is unfair competition.

It was in connection with this last view that when Congressman Mann introduced the pure-food bill several years ago I wrote to Congressman Mann, and also to the Bureau of Standards, suggesting that the wording which was therein contained be changed so as to include also the term "numerical count;" that in any commodity that was dealt in there were only three ways of determining the amount—first, by weight; second, by measure; and third, by numeri-

cal eount. Sueh suggestion was incorporated in the bill as it was enaeted into Federal statute on Mareh 3, 1913.

It is along the lines of this seeond form of legislation that the sale-by-definite-representation bill was drawn up by me and passed by the legislature of the State of New York in 1912. The bill is essentially the same bill which I had recommended and eaused to be introdueed for several years, in faet, sinee 1907, and it would not have passed, even in 1912, if it had not been for the efforts of all the weights and measures offieials of the State, and primarily for the effort and work of the introdueer, Mr. Franklin Brooks, and for the cooperation of Senator T. D. Sullivan. It needed the help that was reeeived from a number of business organizations and eivie bodies, particularly the Federation of Women's Clubs, and more partieularly the Rainy Day Club, of whieh Mrs. A. M. Palmer is president.

The New York State statute relates to representation of the quantity sold. This statute, whieh has been ealled a "eontent of eontainer law," which has been called a "net weight law," is in essence a statute requiring that a representation must be made of how mueh is delivered. In its applieation it refers to food produets, dry goods, hardware, and any commodity bought or sold. Furthermore, it does not apply only to paekage goods, but to any kind or form of eommodity. If it is eontainers or paekages, these must be marked, and if the goods are sold in retail a representation must be made by a tag, ticket, or label attached to the goods showing to the eustomer how mueh is delivered, and this is very essential, beeause it is very questionable whether any statute in any State or any ordinanee in any city relating to weights and measures would hold if it were not also required that a definite representation should be made. The statute recognizes the only three ways in whieh eommodities ean be sold, namely, by weight, by measure, and by eount. The statute reeognizes that any person selling any commodity must have a reasonable variation, beeause there is no sueh thing as absolute aeeuraey. The statute also reeognizes that any legislation affeeting business is for the protection of all, produeer, distributor, and consumer alike, and it should be for the proteetion of honest business rather than for the purpose of harrassing business by showing a big aecumulation of penalties. Some who have ulterior motives or narrow minds are in the habit of prating about proteetion to the eonsumer, and that the manufaeturer and produeer can look out for themselves, but this statute is not designed to be used for sensational purposes of "swatting" the manufaeturer or the produeer or the distributor, but is designed to require fair and honest business dealings, whether large or small.

Under the provisions of the statute the superintendent of weights and measures establishes regulations with the cooperation of the chief or prineipal weights and measures offieials of the cities of the first elass. My idea is that any regulation of that kind whieh affeets business should be the cooperative effort of several, and not be by only one, beeause if by only one it may beeome a matter of politics, and if not of polities it will become a matter of the administrative officer getting into a rut. We have too many illustrations of that

already, particularly in the present tendency toward centralized and bureaucratic government. It is not necessary here to go into the details of all the regulations, but suffice it to say that the preliminary regulations which have been formulated have been formulated under the same policy in which I formulated the specifications for commercial weighing and measuring devices and which latter I tried for several years to get these conferences to take up in a similar manner, and finally the president of this conference did appoint a committee. In these specifications for commercial apparatus the manufacturers were consulted, and the matter was freely and openly discussed. In the regulations under chapter 81, Laws of 1912, data is taken directly from the goods as sold or the goods as put up, and always, even though the variation in some cases may seem excessive, the ultimate value to the consumer, the state of advancement of the art, or the process has been taken into consideration, because it certainly would be economically wrong to attempt to establish a variation so small that although it would be possible it would, from an economic standpoint, considerably increase the cost of production, and therefore increase the cost of the product, and necessarily its selling price, without any accompanying ultimate advantage.

It involves a great deal of work to formulate fair and reasonable regulations, and if we have erred it is rather to err on the side of simplicity and liberality. The basis of all the regulations formulated is that a commodity which is a solid shall be sold by weight, if possible, or by dry measure. Where generally commodities are sold by weight they shall be sold by weight. Liquids may be sold by weight or by fluid measure. Commodities which appear as a unit in the state of nature or manufactured commodities which are not divided into parts when used may be sold by weight or by numerical count. As a concrete illustration of these last I will cite vegetables, eggs, etc., which appear as a unit in the state of nature, may be sold by numerical count. Pills, capsules, etc., which are not separated for use, may be sold by weight or by numerical count. There is no benefit to be gained by selling such commodities only by weight. In wholesale they are generally sold by weight and in retail they are sold by numerical count as a matter of economy and convenience.

In conclusion I will state that chapter 81, Laws of 1912, of the State of New York, known as the Brooks law, is the broadest weights-and-measures statute which I believe exists anywhere. Statements have been made that its provisions are permissive but not mandatory. Such statements are false—the provisions are decidedly mandatory. Any weights-and-measures statute, whether it be called "content of container" statute or "representation of sales" statute, seems to me to be unreasonable and unjust unless it covers all commodities irrespective of whether they are food products or others; in short, it should not apply only to food products; second, is unreasonable and unjust unless the person who formulates any regulations under such also assumes the responsibility; third, is unreasonable and unjust unless it puts the burden of responsibility on the person who launches the commodity; in short, it seems to me to be ethically wrong to prosecute the man who acts simply as a distributor, for instance, of

canned goods, for what may be contained in a can, unless it can be most clearly established that he purchased the goods from the manufacturer or had them made for the purpose of fraud; fourth, it would be unreasonable and unjust not to allow reasonable variations and to restrict absolutely the putting up of commodities in only definite size containers or to require that they be marked only in a certain definite way.

Any statute which applies to the sale of commodities which will embody the above features will be a fair and equitable statute and will be helpful to honest business and will be helpful to the consumer. I am firmly convinced that any statute which does not embody them will be only partially successful. If I can be of any assistance to any of the delegates here, or any weights-and-measures official should want a statute similar to the one discussed above, I will be very glad to take up any of the hundreds of details or give any data relative to the same which I have. You will also get assistance from a great many of the business men, large and small, and a great deal of assistance from civic bodies. These latter will give the greatest amount of assistance if you convince them of the correctness of the principle involved, based upon definite data shown by concrete visual examples. You will also get assistance from State and city weights-and-measures officials who, as a rule, are not afraid to come forward and advocate that which is right and believe in the cooperative spirit of helping one another.

Of course if you advocate a measure which is as broad and as all-embracing as the statute which I have been discussing, you will naturally make a number of enemies, firstly, among the crooks, and secondly, among the cranks. You will find that the crooks and the cranks are not labeled so that "he who runs may read," and many of them are friends of those in power or are friends of friends of those in power. A recent experience of the weights and measures department of the State of New York and myself personally substantiates the above statement. Coming from a clear sky, the weights and measures department was severely criticized by the governor of the State. It is my personal opinion that his excellency the governor was imposed upon with misinformation furnished him primarily by some who do not want the above-discussed statute; by some who wrote letters in response to an appeal by a certain New York City dealer who has conscientiously and consistently opposed anything except his own views, and who was the one who in a magazine published by him called Mr. Walsh, Mr. Quinn, Mr. Stephenson, and myself the four most incompetent men that could be found to formulate regulations under a business statute, again chapter 81, Laws of 1912; by those who are either jealous or antagonistic to me personally; by injudicious statements of some in official position. As far as the attacks on me personally went I cared not, but I do believe that the weights and measures and quantity are of sufficient importance not to have the work throttled by submersion in a larger department, primarily concerned with totally foreign matter, or abolished. The work is too important for the every day protection of business, large and small. At this time I wish to express my appreciation of the interest taken by every weights-and-measures official of the State

of New York, by the press of the State, by the various business and civic organizations of the State of New York, and by the weights-and-measures officials of other States in the matter of retaining a weights and measures department.

If the delegates here when they go home advocate a broad, fair, equitable statute relating to quantity, and more particularly if they should advocate one which would have as its basis definite written or printed specifications for both quality and quantity for all kinds of commodities, they will have the support of all honest business, the substantial civic organizations and the consumers, and when they have that they need not mind the snapping or the barking of the crooks or cranks however big, however powerful in money or position. Of course the person who advocates such a measure may "get lost in the shuffle," but we should be broad enough to look beyond that and advocate the right principle.[1]

FEDERAL REGULATION OF WEIGHING AND MEASURING APPARATUS.

By J. L. Walsh, *Commissioner of Weights and Measures, New York City.* Read by F. H. Tighe, *Deputy Commissioner of Weights and Measures, New York City.*

It can be easily realized that in the United States to-day there are thousands, nay hundreds of thousands, of inferior grades of scales, weights, and measures being sold and used on the market, all of which in the original instance should never have been permitted to be sold, much less used.

We, gathered here to-day, are the ones who have absolute knowledge of the situation, and how well we know that in the vast number of cities and States of our great Union there is no semblance of control or regulation, and into these localities are dumped all the inferior grades of weighing and measuring apparatus. The result therefore is that the merchants of even those cities which have equipped themselves with weights and measures inspection forces are bound to be in receipt of and see in use faulty apparatus of the kind noted above.

When I assumed the commissionership of the mayor's bureau of weights and measures of the city of New York I found its inspection force struggling with the problem of enforcing an ordinance that

[1] In as much as the above paper was only read by title and no opportunity was offered for discussion when it was presented, it seems but proper that certain statements in the paper should not be allowed to go unchallenged.

The author states that "It is a matter of chronological record that the awakening of the importance of weights and measures in other States and in the Federal Government itself came only with the work that is being done in New York State." This is not correct. Massachusetts was doing very effective work a number of years before the State of New York made any provision whatever for the inspection of commercial weights and measures, and as a matter of fact the activity of this State furnished one of the most powerful arguments in interesting the officials of the State of New York in the subject when the question of securing better and uniform weights and measures laws was originally taken up by the bureau with all the States.

The second statement that should be corrected is that in regard to the penalty clause in the barrel bill. The bureau did not draft either the barrel bill or the penalty clause of that bill, and it is not therefore called upon to defend either. The Bureau of Standards was consulted from time to time by the members of the Committee on Coinage, Weights, and Measures and others interested in having the dimensions of the barrel fixed. However, the clause objected to by Dr. Reichmann did not state that the apples in the barrel should not be disturbed by the inspector, but it merely stated that the barrel should be confiscated or destroyed. The very simple and evident duty of an inspector under such a law would be to empty the apples out and confiscate the barrel, and that is exactly what was intended by the author of the clause, who contended that the loss and inconvenience of such a procedure would be quite sufficient to prevent a second violation of the law.—Secretary.

required all manufacturers of weighing and measuring apparatus to have such apparatus inspected and sealed by the mayor's bureau of weights and measures before it could be offered for sale, given away, or sold in the city of New York. I realized, first, that the manufacturers of these instruments were placed at a disadvantage and retarded in the sale of their product, owing to the inadequate force of inspectors necessary to keep up with the demand for sealing such apparatus.

Second. That among the twenty-odd men engaged in this work of testing and sealing there was the likelihood of twenty-odd opinions as to what was a proper scale, weight, or measure to be sealed; that there could be no fixed responsibility against any particular one of these individuals as to what might be deemed an inferior grade.

Third. That there were no organized or specific methods by which the manufacturer could be guided in order to give proper instruments or apparatus into the hands of the inspectors for such testing and sealing.

Fourth. That of my own knowledge I knew there were thousands of scales of false construction sold in the city of New York, not that I believed they were falsely constructed by design but rather by virtue of strict shop economy to meet competition.

Fifth. That the very object for which the bureau was intended—that is, the testing and sealing of weighing and measuring apparatus in actual operation—was entirely neglected, and that there was no protection whatsoever against the unjust and criminal manipulation of same.

With these conditions in mind, a problem was presented as to how the merchant and purchasing public could best be protected by the mayor's bureau of weights and measures. I concluded that the best protection that could be given to the citizens of the city of New York was to guarantee first to the merchant a properly constructed scale, weight, and measure with which to weigh out and dispose of his commodities, and then to see by inspection and reinspection that it was kept in order and always under the scrutiny of our inspection force.

To do this it was necessary that authority be given to me, which resulted in the enactment of the following ordinance:

No person, firm, or corporation shall sell, offer for sale, or give away any weights, scales, beams, measures of any kind, or the tools, appliances, or accessories connected with any and all instruments or mechanical devices for weighing or measuring, intended to be used for the purchase or sale of any commodity or article of merchandise, or for public weighing, within the city of New York until a type or types of said weights, scales, beams, measures of every kind, or the tools, appliances, accessories connected with any or all instruments or mechanical devices for measurement or public weighing with the specifications as to construction shall have been submitted to and approved by the commissioner of the mayor's bureau of weights and measures. The commissioner shall when said types are approved designate a serial number, which serial number shall be used in identifying the type approved. A record of the serial numbers and to whom furnished shall be kept in the office of the commissioner of the mayor's bureau of weights and measures.

Any person, firm, or corporation who sells, offers for sale, or gives away within the city of New York any weights, scales, beams, measures of any kind, or the tools, appliances, or accessories connected with any and all instruments or mechanical devices for weighing or measuring, intended to be used for the purchase or sale of

any commodity or article of merchandise, or for public weighing within the city of New York, that do not comply with the specifications and type submitted and approved by the commissioner of the mayor's bureau of weights and measures, as provided in this section, shall be liable to a penalty of $100 for each and every such offense.

When the foregoing became a section of the city ordinances I immediately concluded that I must equip the bureau in a manner which would appeal to the scientific and technical sense of weighing and measuring apparatus manufacturers. There was created a mechanical division in the boroughs of Manhattan, Brooklyn, and Queens. To each of these divisions there was assigned an inspector of 12 years practical experience in scale inspection, men who by their very actions had shown to me that they possessed mechanically developed minds. In each of these divisions was placed the most accurate instruments for the purpose of testing that could be purchased in the United States or Europe.

With this equipment installed, and preparations having been scientifically made for handling this problem, the next thing was to bring to the knowledge of the manufacturers of these instruments notice of the fact that for noncompliance with the aforesaid ordinance the penalty would be strictly enforced. Their visits as a result of this notice brought the manufacturers to the realization that we had equipped ourselves for this work, and be it said to their credit they immediately responded and submitted their apparatus for test. Manufacturers that did not comply with the specifications adopted by this bureau were made to realize it by the condemnation of their instruments in the mechanical divisions and by the inspection force in the field. And the merchant and purchasing public were gradually educated to the point that only such instruments bearing the serial number of the mayor's bureau of weights and measures were permissible for use in the city of New York.

Nowhere in the United States has this experiment ever been made, and nowhere in the United States could this experiment have been better made than in the city of New York. And its success—of which there is absolutely no question—has shown the practicability and necessity of national regulation.

I believe that the control of the mechanism of weighing and measuring apparatus should lie with the National Government, and so let it be known to all weighing and measuring device manufacturers.

One can readily appreciate up to date that with the activity of the mayor's bureau of weights and measures of the city of New York, the state department of the State of New York, the departments of weights and measures established in the States of Wisconsin, Minnesota, New Jersey, and Vermont, wherein each State official has direct power to make rules and regulations, with the English Government requiring one type, the Dominion of Canada another, Mexico, Japan, Austria, France, and Germany still others, and gradually the adoption of similar or different regulations in each of the States of our Union, quickly you can realize how soon the weighing and measuring apparatus manufacturer will seek national legislation for the protection of his capital and mechanical genius. And there let us hesitate.

It should be the first principle of every weight and measure official to have before his mind the mechanical genius engaged by scale manufacturers and the capital behind it which must be protected by our Government.

With this in mind, realize the adoption of weighing and measuring apparatus regulations by every State in the Union. Then realize the probable and most likely variances of the human mind in control of these different regulations.

Then realize the manufacturer whose business has developed into an export and interstate line, and you will readily realize the chaotic condition of the manufacturer in trying to comply with these regulations. Therefore let us be careful in the introduction of legislation that we as officials in the protection of the merchants and purchasing public try for the promotion of laws which shall best protect capital and mechanical genius in its honest distribution.

I believe that the time for control and supervision of weighing and measuring apparatus by the National Government has arrived.

I believe that the now great scale business of the United States of America is in its infancy. Therefore, as with every industry that starts to grow, there come laws and regulations governing that particular industry. And what do we find, and whom do we find best organized for the protection of this industry and the purchasing public? Right before our eyes lies the National Bureau of Standards of the Department of Commerce, with its practical and scientifically trained minds, which with a constructive law giving to it the authority to pass on types of weighing and measuring apparatus, giving thereto a stamp of approval by designating mark, same to be published and distributed throughout the different States of our Union, with the aid of the United States Customs Department, to see that false apparatus manufactured in foreign countries, but prohibited from sale or use in such foreign countries, prevent same from being dumped into this our own country, will be the solution for the abolition from sale of defective weighing and measuring apparatus.

I believe that Federal control of weighing and measuring apparatus must come, and it is the only proper solution for the scale industry. And in that I talk to the manufacturers themselves, because they can realize that this legislation is bound to come in either State or National form. And those of the industry who are using their capital and mechanical genius for the invention and the betterment of proper apparatus can best be protected by the enactment of national rules and regulations for the manufacturing of such apparatus.

I believe that when commodities are sold upon which the human life is dependent for sustenance, that it should be measured on the most accurate scale that mechanical genius can develop, and that if the housewife is going to check the purchases from the merchant she must do so upon a scale that is as reliable and as accurate when used for the purpose of comparison.

If I am correctly informed, there is contemplated the introduction of a law giving the Bureau of Standards the control and preparation of regulations governing the sale and offer of sale of weighing and measuring apparatus. There is absolutely no question as to the

necessity and justification of this legislation. And the only issue which may arise is that of State control over this subject.

If I have not been clear in my discussion as to why this should not be, then I fail in the purpose for which this paper is intended. But if such legislation should reach the position of argument—of which there should be none—before the committee in the national body having control of such legislation, with the permission of his honor the the mayor, William J. Gaynor, who has been foremost in the promotion of legislation and honest endeavor for the protection of the merchant and purchasing public, I shall expect that the gentlemen in charge of the National Bureau of Standards will see that I get my proper day before such committee to advance arguments, if they be necessary, on this now all important subject.

Mr. TIGHE. Mr. President and gentlemen, on behalf of Commissioner Walsh I wish to thank you for your kind attention.

DISCUSSION.

Mr. KEACH. Mr. Chairman, I wish to put one or two questions to my colleague from the State of New York, just to clear up a matter which I hope will be of information to all the States. I would like to ask Mr. Tighe if in his experience in the city of New York the merchants do not use the wine measure very frequently. Have you discovered any such violation as that?

Mr. TIGHE. In answer to that I would state that the merchants of New York City use only serialized apparatus which are of standard capacities.

Mr. KEACH. Even so, but substituting one for the other?

Mr. TIGHE. That is contrary to our law, and the citizens of New York realize that it is contrary to law, and they do not use measures where they should not. Am I plain in my answer?

Mr. KEACH. Are you an inspector?

Mr. TIGHE. I am deputy commissioner, but I have had 12 years' field experience.

Mr. KEACH. Do your deputies attempt to find out about that? Do you have any complaints from customers and consumers?

Mr. TIGHE. Why, that is the ordinary work of the inspectors; and where they find such a condition existing the merchant is penalized.

Mr. KEACH. Have you collected fines of that character?

Mr. TIGHE. We have collected thousands of dollars in fines in New York City.

Mr. KEACH. All right; that is all.

The CHAIRMAN. For the sake of those who were not here last year, let me say that the bureau has always favored national legislation along these lines. A few years ago a bill on this subject was introduced. What opposition there was came from some manufacturers who probably did not understand that it must come sooner or later. However, the real difficulty is that with the change of administration there is a new committee—and an excellent one with an excellent chairman; but they are a little diffident about taking up this matter. Now, we have already decided that we would have this bill introduced

and push it, but it can not be done at this special session because committees have not been appointed; and it may be that the bureau will wish to call upon you for assistance. In fact, we surely will; and when the time comes we hope that all of you will do what you can to assist in getting this bill through. I can hardly believe that there will be any objection whatever to such legislation, although some did develop the last time. Undoubtedly this legislation must come.

TESTING OF DRY GAS METERS.

By M. H. Stillman, *Assistant Physicist, Bureau of Standards.*

I. OUTLINE OF METER-TESTING METHODS AND CONDITIONS FOR ACCURACY.

Since the ordinary consumers' dry gas meter measures the volume of gas passing, the most direct and natural way to test this type of meter is to pass a known volume of gas through the meter and notice whether the indicated volume is correct.

The present methods of accomplishing this consist generally in either—

(*a*) Supplying the testing medium to the meter under test from a meter prover.

(*b*) Passing the testing medium (air or gas) through a standard meter and the meter under test, in series.

In order to obtain correct results by the use of the above methods the following conditions are requisite:

(*a*) When using a prover, the prover shall correctly indicate the volume of testing medium *delivered* by it.

(*b*) When using a standard test meter, this meter shall correctly indicate the volume of testing medium delivered *to* it or delivered *by* it according as the standard meter is on the outlet side or the inlet side of the meter under test.

(*c*) When using either prover or standard meter, there must be no appreciable change in volume of the testing medium during its passage from the standard apparatus to and through the tested apparatus.

In order that the above-listed three requirements be fulfilled [1]—

(*a*) Meter provers or standard test-meters must be correctly calibrated.

(*b*) The testing medium (air or other gas) and every part of the system which might influence the temperature of the testing medium during the test must be at the same temperature, and this temperature must remain constant during the test.

(*c*) The mass of gas which is measured successively by the standard instrument and the instrument under test must be at practically constant pressure. Inasmuch as dry meters at normal rate operate with less than one-half inch (of water) loss of pressure, the changes in volume due to variations in pressure are usually negligible.

[1] It is of course impossible to comply absolutely with these requirements, and practically it is not necessary. The approximation to the conditions stated in these requirements that is necessary for commercial work will be discussed later in the paper.

(*d*) The testing medium must not during the test absorb or lose any vapors or other gases which may change its volume appreciably.

From this last statement it is evident, (*a*) that the presence of any liquids of high vapor pressures at any part of the system touched by a testing medium unsaturated by the vapors of those liquids, must be taken account of and prevented, if possible; (*b*) that any liquid in contact with the testing medium must be so related to the latter that it will not absorb any appreciable volume of it.

Frequent reference to the above-mentioned sources of errors and the precautionary measures to be taken in their avoidance will be made in what follows.

The method of testing consumer's meters on the premises, using a calibrated meter for the purpose, has not met with favor from those who have had experience with it and has been strongly condemned by some. Inasmuch as the meter-prover method is rapid and also accurate when reasonable precautions are taken in its use, this method is the one almost universally used at the present time for the testing of consumer's dry gas meters. We will therefore immediately pass on to a discussion of meter testing—or meter proving as it is usually called—by the use of the ordinary type of prover. The testing of meters by this method involves their removal from the consumer's premises to a station equipped with the necessary testing apparatus.

II. METER PROVERS AND ACCESSORIES.

The type of prover used most extensively in this country is generally known as the "Standard" (fig. 1) and is usually made in 2, 5, 10 and 20 cubic foot sizes. The smaller gas companies usually require only the 2-foot size of prover; but when many meters larger than the 10-light size are to be tested a 5-foot prover is preferable. Only in large cities or under exceptional conditions is it necessary to have larger than a 5-foot prover.

Comparatively recently there has come into use in this country a variation of the "Standard" type of prover known as the "Automatic" (fig. 2). Provers of this type are used to test meters by measuring the volume of gas passing through the meter for one revolution of the meter tangent. To this type of prover the meter is usually connected by a semiautomatic clamp connection, and when one revolution of the tangent has taken place the prover outlet is automatically closed.

The "Standard" type of prover is so well known as to require little description. There are, however, provers on the market which have certain features contributary to convenience and accuracy which recommend them above others, and it is desirable that we mention the more important of these.

The tank is often made annular in order to reduce the amount of water needed to fill it. This permits the prover to assume room temperature more rapidly, allows more rapid filling and emptying, and makes the whole apparatus less heavy. The air passage from the bell leads down through the center of the core and up on the outside of the tank. The bell is usually made of copper or galvanized

iron. The copper bell though initially more expensive is considered by some to be in the end the more economical because of its greater resistance to corrosion. Another advantage claimed for the copper or brass bell is that, if kept well polished and slightly oiled, practically no water will adhere to its surface.

In some of the more recent designs of provers the tank is raised from the floor by legs with screw feet. This facilitates the leveling of the apparatus and by allowing the free circulation of air under the prover the lag of the temperature of the prover and contents behind that of surrounding air is reduced. This construction also lengthens the life of the prover by preventing the accumulation of moisture upon the underside of the tank and the consequent corrosion.

Some provers of the later designs have their pressure gage conveniently placed at about the level of the observer's eyes instead of down at the valves as is usually the case. When so located the pressure gage should be connected to a point outside the outlet cock by means of a small metallic tube which must be free from leaks. The thermometer for indicating water temperatures is sometimes held by a bracket in a convenient position, only its bulb dipping into the water. The thermometer for indicating air temperatures should be placed near the pressure gage at about eye level in order to facilitate the taking of readings.

The almost universal practice at the present time is to use water as a sealing liquid in the prover tank. A cock is provided at the bottom of the tank to draw this water off when so desired. More will be said later as to the use of water as a sealing liquid.

As was stated in the first few paragraphs of this discussion of meter testing, it is absolutely essential that we know to a high degree of accuracy the volume of the testing medium passed through the meter. The volume of a given mass of a gas under constant pressure (the gas in the meter-prover bell is at constant pressure) is dependent upon the temperature of the gas and the amount of other gases (water vapor for example) that is mixed with it. These facts must be constantly kept in mind when installing and testing meter provers and meters.

The makers of meter provers usually, if not always, furnish instructions for setting up their apparatus, and these should of course be followed to insure the correct assemblage of parts. In order to guard against undesirable changes of volume of the testing medium in the prover bell care must be taken to protect the prover from the radiation from stoves, radiators, or other heat sources. Neither should sunlight be allowed to fall directly upon or very near the prover. The prover should also be well protected from drafts of every kind, for even the movement about the prover of air at the temperature of the other air of the room may under some conditions cause changes in the temperature of the air in the prover bell. The meters which are compared with the prover must also be at the temperature of the prover. A difference of temperature of 2° C. (=3°.6 F.) between the prover and meter may cause an error of 1 per cent.

Since the prover should be at the same temperature as the air of the room, means should be provided for conveniently changing the

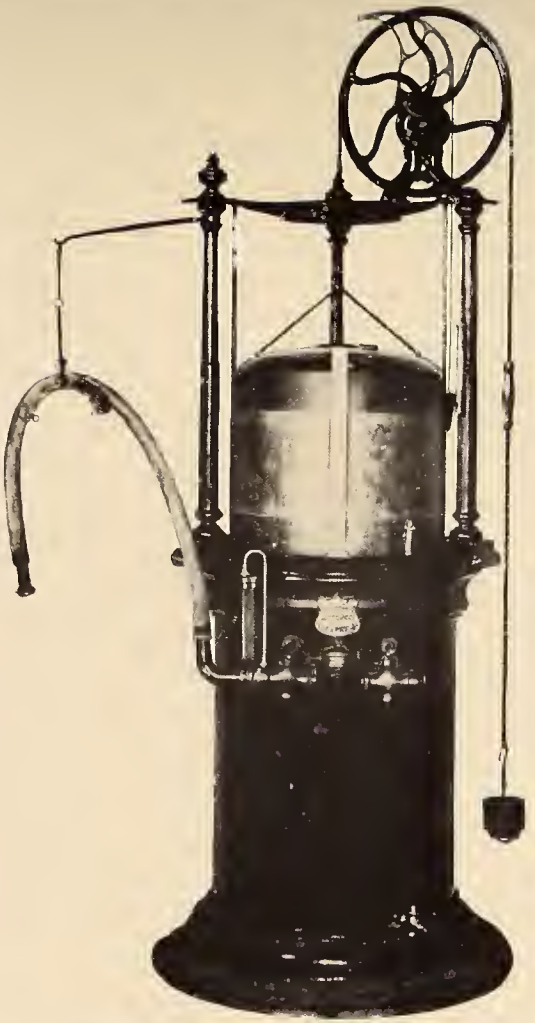

Fig. 1.—"*Standard*" *meter prover.*

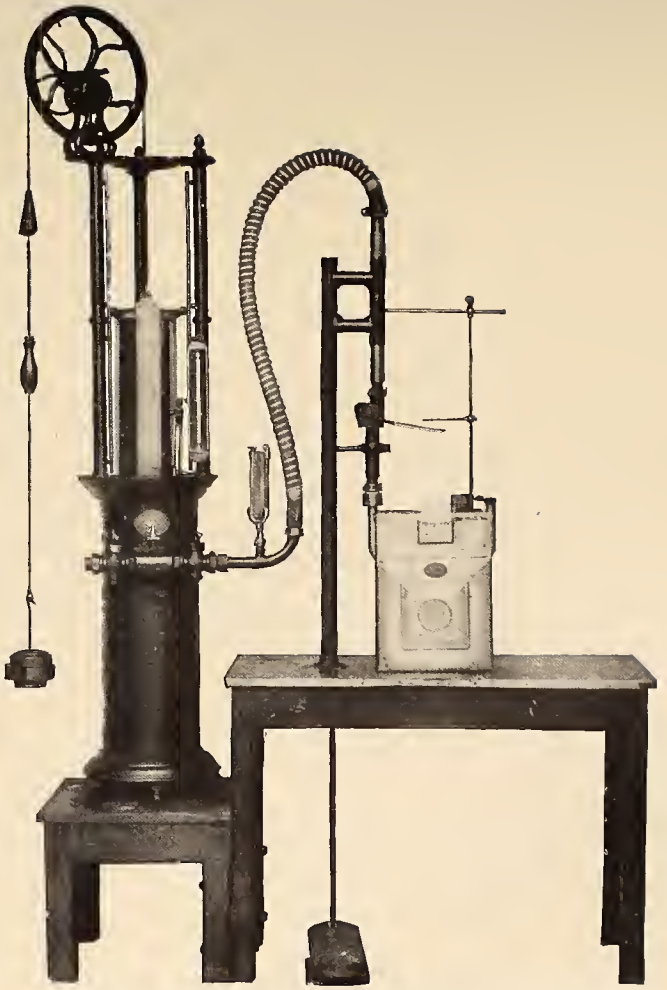

Fig. 2.—"*Automatic*" *meter prover with dry meter in position for test.*

temperature of the water in the prover tank. This is commonly done by adding hot or cold water to the water in the tank and withdrawing an equal amount of the original water. Sometimes means are provided for injecting either cold water or steam into the tank and removing the required amount of water by providing the single inlet valve with suitable steam, water, and sewer connections. Great care should be taken that the water in the tank is thoroughly mixed before comparing the temperature of the prover with that of the air of the room.

It is necessary to arrange at one side of the prover a bench or table on which meters may be placed during the test. If one man uses two provers, the bench may be placed between these and the two meters under test at any one time are thus conveniently near the operator.

The hose for connecting meter and prover should be supported in such a manner that it will not become so cramped as to be ruined after only a short period of usefulness. A supporter is generally provided with the prover, which serves the purpose very well.

Care should also be taken to insure that the circular slide valve be kept in good condition. In order to do this, it should be kept well greased and free from grit, for if grit is allowed to gather and remain, leaks will certainly result. The cap usually furnished with meter provers should therefore always be kept over the circular slide valve when the prover is not in use. The other valves must also be kept clean and well oiled.

When the prover is not in use, the bell should, if possible, be always raised completely out of the water in order to prevent unnecessary corrosion. This precaution is especially important with those provers provided with galvanized-iron bells. The water in the tank should be kept clean and all surfaces of the prover should be cleaned frequently. The inside of the tank and outside of the bell of galvanized-iron provers should be kept well painted, but the inside of the bell should not be painted.

Care should be exercised to insure that the chains attached to the counterweights are flexible and lie smoothly upon the wheel and cycloid and that no binding occurs in the moving mechanism. It is a simple matter to determine whether the prover bell operates without excessive friction. Assuming that both of the prover counterweights have been correctly adjusted in the manner hereafter described, vary the wheel counterweight—the larger counterweight—until the pressure gage indicates that the pressure within the bell is one-tenth inch of water. Then with the bell in its highest position, open the circular slide valve and, if there is not undue friction, the bell will descend steadily and smoothly to its lowest position.

The counterweights should of course be such that the pressure applied to the air in the bell will be constant—usually $1\frac{1}{2}$ inches of water—irrespective of the position of the bell and therefore of the amount of air in the bell. It may be well to describe here the method of properly adjusting the two counterpoise weights. The function of the cycloid and attached weight is to compensate for the buoyant effect of the water in the tank upon the metal of the prover bell as the latter sinks into the water. Then to determine whether the cor-

rect weight is attached to the cycloid, open the circular valve and with the bell in any position, weight the other counterweight until the bell will neither rise nor fall when left to itself with the valve open. If the cycloid and cycloid counterweight are correct, this state of equilibrium will continue with the bell at *any* height relative to the tank. If this condition is not fulfilled, adjust both counterweights until it is. It is apparent that if the valves into the bell be either closed or open, atmospheric pressure obtains within the bell. This should be remembered, as reference will be made to it later. Now, if it is desired to maintain a certain pressure above the atmosphere within the bell, remove weights from the other counterpoise (the wheel counterpoise) until the manometer shows the correct reading. In making this last adjustment, all valves except the outlet valve beyond which the manometer is connected, should be closed and the outlet pipe beyond the manometer connection also stopped up. The pressure in the bell should now be the same irrespective of the amount of air in the bell; or in other words, irrespective of the height of the bell relative to the tank.

TESTING THE PROVER FOR LEAKS.

If there is sufficient time available, the test for leaks is preferably made in the following way: The bell should be filled with air or other gas and allowed to stand until this contained gas is saturated with water vapor and the outside of the bell is thoroughly dry (this may take a couple of hours). Then discharge the air or gas from the bell until the scale on the bell indicates 1 cubic foot remaining. Now leave the bell in its supposedly air-tight condition over night or for 24 hours. In this way, a very small leak will allow all, or a very large part of the air or other gas contained in the bell, to be discharged. If there is not a decrease of more than 7 or 8 per cent of the volume contained in the bell the night before, and the temperature is not more than a few degrees different, the leakage, if any, may be considered negligible for ordinary testing purposes.

If the test outlined above can not be made on account of lack of time, a shorter test can be made, provided that the temperature of the room remains constant within a half degree Fahrenheit for about 20 minutes. Saturate the air of the bell and dry its outside surface by allowing it to stand as in the above-described method. Then run the bell down to within about an inch of its lowest position, close all prover valves, and if in 20 minutes no easily appreciable lowering of the bell takes place, it is usually safe to assume that no serious leak exists.

Although practically all provers sold are carefully calibrated by the manufacturers, it is not always safe to rely upon the tests thus made. For official use in meter testing it is absolutely essential that the prover be calibrated by the inspector in order that he may be able to certify his results. Except in small cities where very few meters are tested, the meter prover should be occasionally tested by comparison with a cubic-foot bottle which has been certified by the National Bureau of Standards.

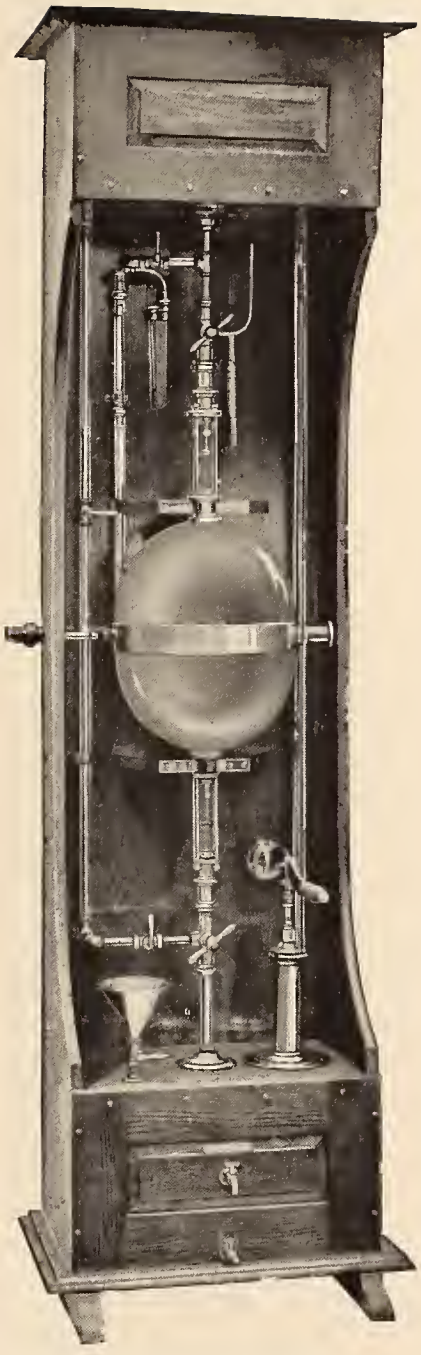

Fig. 3.—*Cabinet type cubic-foot bottle.*

III. THE CUBIC-FOOT BOTTLE.

Two types of cubic-foot bottles are commonly employed in this country—the cabinet type, one form of which is shown in figure 3; and the immersion type, a form of which is shown in figure 4. Either type of bottle discharges a cubic foot of air by displacing this volume by an equal volume of water; the difference between the two types lies in the method by which this displacement is accomplished. The cabinet type of bottle remains stationary during the test, and no water touches the outside of the bottle. The immersion bottle, on the other hand, is filled and emptied of air by being alternately raised and submerged in a tank of water; it operates on the principle of the ordinary meter prover.

The most serious disadvantage of the immersion type of bottle in comparison with the cabinet type is that, as generally used, the evaporation from the wet outer surface of the former type of bottle cools the gas inside, thereby decreasing its volume and so introducing inaccuracies into the test.

The cabinet type of bottle is a much more complicated and expensive piece of apparatus than the immersion type. It is much harder to clean, requires more care in lubrication and to prevent leaks in the many connections. It is therefore doubtful that a cabinet bottle will give greater satisfaction than the simpler and cheaper immersion bottle. With the exercise of proper care, the last-mentioned type of bottle may be made to give excellent results.

A modification of the cabinet type of bottle, which is usually made only in small sizes, such as one-tenth or one-twelfth of a cubic foot capacity, is shown in figure 5. This type of bottle finds its most extensive use in the calibration of experimental meters, but it can also be used to calibrate small provers. Where portability and simplicity is necessary, this type of bottle excels.

As the cubic foot (or fractional cubic foot) bottle is the basis of all the gas measurements made by a company or an inspector, the accuracy of the bottle should be very well established. If so requested, the bottles are furnished by most American makers after test and certification by the National Bureau of Standards. The Bureau of Standards will also test and if correct, certify cubic foot bottles submitted to it, whether they have been tested or certified before or not. Such standardization is very desirable, both for new bottles and for those which have been in service for sometime.

IV. THE CALIBRATION OF METER PROVERS.

1. GENERAL CONSIDERATIONS.

As stated before, water is almost universally used as the sealing and displacing medium in provers and in cubic-foot bottles, so that in this discussion it will be assumed that water is the medium used unless the contrary is specifically stated.

The comparison of the prover with the cubic-foot bottle can be made—

1. By measuring air into the prover from the cubic-foot bottle.

2. By first filling the prover and then measuring the air out with the cubic-foot bottle.

Both methods should, of course, give the same result if the volume of the proving medium involved in the test remains constant during the test.

Since, as will be explained later, in bottling out of the prover the air involved in the test can be usually kept in a more nearly constant condition than by the other method, this method is generally preferable. It is often recommended that for each test of a prover comparisons be made both by the method of bottling in and bottling out of the prover. Unless lack of time prevents this plan being followed, it is well to make both forms of comparison.

Calibrations should agree with each other within three-tenths of 1 per cent and no prover should be used unless it is correct within five-tenths of 1 per cent. Recalibration of a prover once a year is usually sufficient unless the prover has been roughly handled or its mechanism thrown out of adjustment. When a State inspector supervises company testing, it may seem impossible to recalibrate all provers once a year, but with a portable one-tenth cubic foot bottle it is not hard to check a wet meter and then run this against the prover at least that often. This method is not recommended except when the regular cubic-foot bottle test can not be made, since with ordinary care it is not capable of as high accuracy. However, by such a test, if carefully made, an error in the prover of more than five-tenths of 1 per cent would be detected.

While calibrating a prover it is very desirable that the air of the room be saturated with moisture. If the air is not saturated, special precautions should be taken, as advised in the description of the various methods.

In all four of the methods of calibrating a prover by comparison with a cubic-foot bottle which are described below, it is essential—

(*a*) That all parts of the apparatus which can affect the temperature of the contained gas be at one temperature and that this temperature remain constant during the test.

(*b*) That the air used in the test be very nearly or completely saturated with water vapor.

2. BOTTLING OUT OF THE PROVER WITH A CABINET BOTTLE.

Some hours before calibration of the prover with the cubic-foot bottle, the prover bell should be raised as far as possible without unsealing it, so that the air in the bell will be fully saturated with water vapor before the calibration and also to insure that the outside of the bell will be dry. At this time the cubic-foot bottle should also be filled with air by causing it to displace the water in the bottle. The volume of air in the bottle is then connected to the volume of air in the prover bell and the apparatus allowed to remain thus in a room of uniform temperature for several hours and preferably over night. This procedure will insure that the apparatus and contained air are at practically the same temperature and that the air in both prover bell and bottle is saturated. If there is a serious leak in the prover,

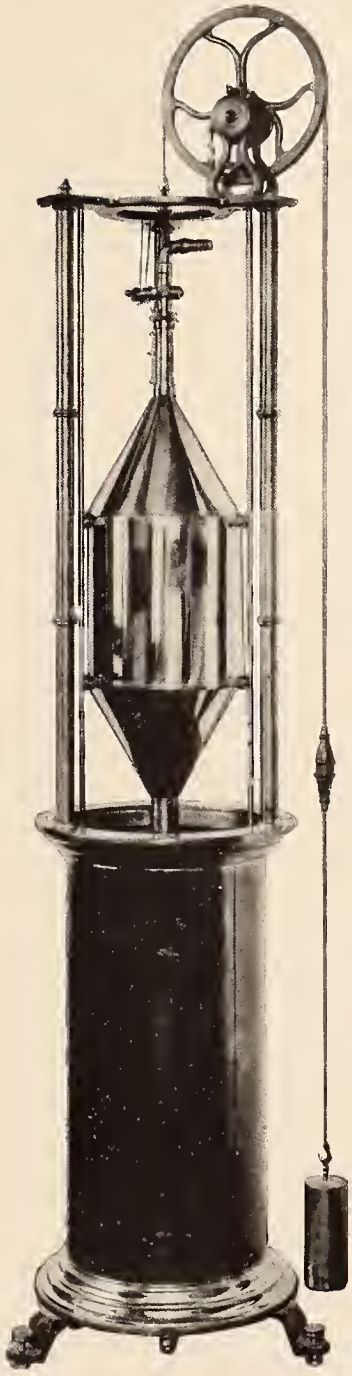

Fig. 4.—*Immersion type cubic-foot bottle.*

bottle, or connections, the fact will be made known by the lowering of the bell. If, just before the test, the bell does not change its height by an easily appreciable amount in five minutes, it is safe to continue with the test. The bottle should now be filled with water to the mark on the upper glass tube and enough air allowed to escape from the prover bell to the open air to bring the pointer exactly to the zero mark of the prover scale. The air from the prover is then allowed to pass into the bottle until the water level in the latter just reaches the mark on the lower glass tube, when the lower water valve to the bottle is closed. The air in the bottle is now in the same condition as to pressure, temperature, and relative humidity as the air in the prover bell, so that it represents an actual cubic foot extracted from the latter.

A cubic foot of this air in the bottle is now ejected to the open air by closing the valve to the prover, opening the top valve leading to the open air, and then raising the water in the bottle until its surface reaches the mark on the upper glass tube. The valve to the open air is now closed and another cubic foot of air drawn from the prover.

In this method of calibration, the prover is operated just as it will be used in meter testing, and no change of counterweights is necessary. If it is desired to make several calibrations of the prover in succession, then the procedure of allowing the outside surface of the bell to dry off gradually and the air inside of the bell to become gradually fully saturated, can not be used. It has been recommended by some that the outside of the prover bell be rubbed with oil, which to a large extent will prevent the water from adhering to the surface as the bell is raised. It is also recommended that in order to saturate the air it be drawn into the bell over or through water. If the air of the room in which the calibrations are carried on has been previously saturated with water vapor by means of suspended wet blankets or otherwise, none of the above mentioned errors due to evaporation can occur; but this saturated condition is often very inconvenient to attain in ordinary practice.

It is desirable that we now discuss more in detail the cause of the errors mentioned in the last paragraph.

When the bell of a meter prover is raised from the water into unsaturated (dry) air and at the same time this unsaturated air is drawn into the bell of the prover, two important effects follow:

(*a*) The evaporation of the water from the wet outside surface of the bell cools the metal of the bell and therefore the gas inside of it. This causes the gas to decrease in volume.

(*b*) The evaporation from the wet surface inside of the bell cools the air in the bell, and simultaneously this introduction of water vapor tends to increase the volume of the inclosed air. Experiment has shown that the effect of the cooling is generally by far the more important. To illustrate: The bell of a 5-cubic-foot meter prover was rapidly raised and then all valves were tightly closed. For more than 15 minutes a lowering of the bell took place, showing a total decrease of eight-tenths of 1 per cent in the volume of the contained mixture of air and water vapor. The volume then started to increase,

and about 38 minutes after the beginning of the experiment the volume was the same as the initial. The volume then continued to increase for some time, until the final volume was more than four-tenths of 1 per cent greater than the initial. It should be understood that, while with the air in the room at different temperature and relative humidity than when the above-described experiment was performed, the magnitude and duration of the phenomena would be varied, the above-described behavior of a meter prover may be regarded as typical in a qualitative sense. Now, if we suppose that instead of the same amount of air remaining in the bell during these phenomena, air is being drawn out, these effects of evaporation will still take place, but on a constantly decreasing quantity of air, so that the change in volume indicated by the prover will not be the actual volume discharged from it; the actual volume will not be known. The magnitude of the error due to the above-mentioned causes depends, among other things, upon the condition of the air surrounding and inside the prover and upon the dimensions and design of the prover.

3. BOTTLING INTO THE PROVER WITH A CABINET BOTTLE.

The measurement of air into the prover 1 foot at a time is less convenient than the method of bottling out as described in method 1, since it is necessary to saturate the air 1 cubic foot at a time before measurement by the bottle or it will continue to take up water and, therefore, to expand after measurement. Errors up to 3 per cent or even more may be made by neglecting to saturate the air before using. Another difficulty in bottling into the prover is that, as the bell rises from the tank wet, the cooling effect of the evaporation from its surface may be appreciable unless considerable time is allowed after the air enters the prover before the prover reading is taken. If means are taken to prevent the wetting of the outside surface of the bell, this last-mentioned source of error, of course, disappears.

Another disadvantage of this method is that the testing must be carried on at atmospheric pressure, which involves the changing of the bell counterweights, and thus the prover is tested under different conditions than those under which it will be used to test meters.

The operations in the actual comparison of the prover and bottle are evidently practically the reverse of those in bottling out of the prover. As stated before, each cubic foot of air must be saturated before introduction into the prover. This saturation is most quickly and conveniently effected by drawing the air into the bottle through or over water.

On account of the elaborate precautions necessary to obtain accurate results by the method of bottling into the prover, it is probable that the method of bottling out will be found more satisfactory.

4. BOTTLING OUT OF THE PROVER WITH AN IMMERSION BOTTLE.

The immersion type of cubic-foot bottle, as noted before, operates in a manner very nearly the same as the ordinary prover. The bottle, however, has no auxiliary mechanism for maintaining con-

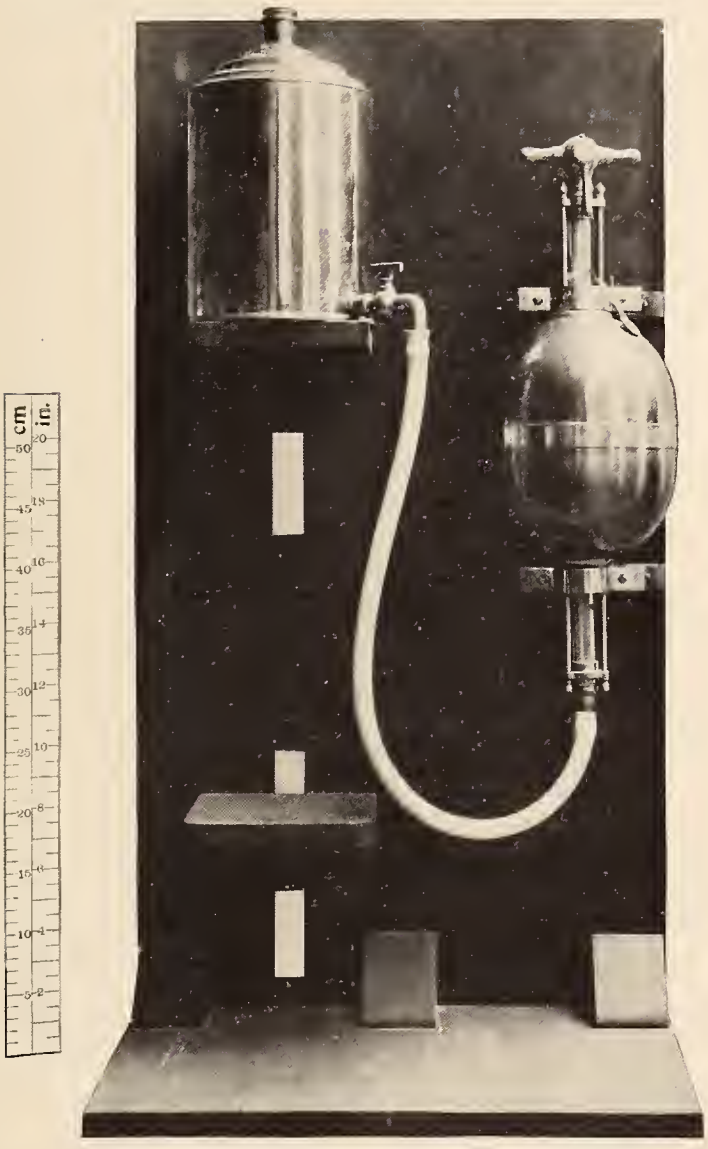

Fig. 5.—*One-tenth cubic-foot bottle.*

stant air pressure within it and has need of none. The method of filling and emptying would seem to be so evident from the construction that no detailed instructions are needed.

Bottling out of the prover with an immersion bottle may be done with the testing medium either at atmospheric pressure or at the pressure at which the prover is used to test meters.

When bottling out with the air in the prover and bottle at atmospheric pressure, the bell is of course counterpoised, as previously described. It is preferable in most cases to test the prover under the ordinary working conditions, and in this case it is not necessary to adjust the counterweights. When using an immersion-type bottle in this way to measure the more or less compressed air out of the prover, the water in the bottle will be at a lower level than that outside in the immersion tank because of the air pressure within. It is therefore necessary to take precautions to prevent losing any air from the lower orifice of the bottle. A convenient method is to make a mark on the outside of the lower neck of the bottle at a distance from the lower orifice equal to the height of the water column (generally $1\frac{1}{2}$ inches) maintained by the air pressure in the prover. Then in measuring air out of the prover the bottle may be raised from the water until this mark is very slightly below the surface of the water of the immersion tank, at which time the bottle is practically filled with air.

In the case of bottling out with the immersion bottle, the prover bell may be raised several hours before the test so that it will be dry and the air inside saturated when the test is commenced. Then the only error due to evaporation, even though the air of the room be unsaturated, will take place by the cooling of the wet outside surface of the cubic-foot bottle. It is probable that this error will not be serious if the outside surface of the bottle is kept well polished and slightly oiled so that very little water will cling to it.

5. BOTTLING INTO THE PROVER WITH AN IMMERSION BOTTLE.

This method is the reverse of the preceding, with the exception that it is practically necessary to use atmospheric pressure in the bottle and prover during the test. In order to accomplish this it is necessary to increase the wheel counterweight—not the cycloid counterweight—according to the instructions given under the description of meter provers (p. 93).

This method has the disadvantage that the air of the room must be completely or very nearly saturated with water vapor, or that care must be taken to have each cubic foot of air saturated with water vapor before being measured out of the bottle into the prover and that no water clings to the outside of the bell or bottle. Here, again, the oil coating might be used with advantage on both bottle and the outside of the prover bell. The errors that may occur when saturated air is not used may amount to 3 per cent or even more. The importance of these precautions is therefore evident.

Another disadvantage in using the immersion type of bottle with atmospheric pressure in the bottle and prover, whether the operation

consists of bottling in or out of the prover, is that the prover is tested under different conditions than actually obtain during the test of meters.

V. SUBSTITUTION OF OIL FOR WATER IN TESTING APPARATUS.

In what has gone before, we have assumed that water was used exclusively as a sealing and displacing liquid in the meter-prover tank and with the cubic-foot bottles. We have also given the precautions that are necessary in order to get accurate results when water is used.

In view of the errors introduced into measurements of volumes of gases where water is involved as a sealing and displacing liquid, it would seem that it would be a great advantage to use an oil of low viscosity and low vapor pressure as a substitute for water. This could be used with both the cabinet and immersion types of cubic-foot bottles and also in the prover tank. The advantages of this would be—

1. All errors due to change in volume by the introduction of a vapor into the testing medium would be avoided.
2. Errors due to a change of volume caused by the cooling effect of evaporation on the outside surface of the bottle and prover bell would also be avoided.
3. The specific heat of the oil being much less than that of water, the temperature of the prover and contents would more closely follow that of the air of the room.
4. The testing apparatus itself would not be injured by the sealing liquid, but rather preserved in good condition.

Thus the cubic-foot bottle and meter prover could be compared with much greater accuracy and far less trouble than when water is used. Also, the errors in actual meter testing could be very largely reduced, since no undesirable change of volume of the air (assuming the temperature of the room constant) would occur.

The Bureau of Standards will soon take up the problem of finding an oil suitable for use in meter-testing apparatus.

VI. COMPARISON OF METERS WITH METER PROVER.

Having made sure that the prover is sufficiently accurate, the meters may now be compared with the prover, which operation constitutes the actual testing of the meters.

Since the object of testing meters is to determine the volume of gas delivered to the consumer, it is very desirable that the meters be tested as nearly as possible under the actual working conditions. Of course, the ideal way would be to test the meter on the consumer's premises with the gas delivered at that point, but since this is impractical, the attempt is made to approximate these ideal conditions to a greater or less extent. In doing this the conditions are generally as follows:

1. Meters are generally tested with the testing medium at the inlet at a pressure of 1½ inches of water.

2. Most meters, especially if not properly adjusted, give different results depending upon the volume of gas passing through them in unit time. For this reason, it is usual to test at "normal rate" and sometimes at twice and one-third this normal rate.

3. Gas is sometimes used as the testing medium, although air is more generally used. The use of gas for this work is increasing.

As has been emphasized before, in comparing volumes it is necessary that the unit of measure remain the same during the operation, that is, the volume of a given mass of the testing medium shall remain constant. It is thus of the utmost importance that the meter to be tested be at very nearly the same temperature as the prover and contents. For this reason, the meters to be tested should be subjected to the same temperature as the prover for several hours. The difference of temperature between the meter and prover should certainly not be more than 2° F.

The means of bringing the temperature of the contents of the prover quickly to that of the air in the room has already been given during the discussion of meter provers.

Again, if water is used in the meter prover, as is generally the case, the air of the room should be very nearly saturated or serious errors may occur, due to evaporation from the inside and outside of the bell. Means of preventing this have already been discussed and recommended.

Theoretically, to secure the greatest accuracy, meter-provers should be compared with cubic-foot bottles and meters should be tested, at a temperature of 62° F., since this is the temperature at which the cubic-foot bottle is standard. Fortunately, however, this is not necessary to get results that are sufficiently accurate.

When the testing apparatus is in readiness, the meter to be tested is placed upon the bench provided for it and connected to the prover by a rubber hose furnished with the proper connecting unions. Care should be taken that good washers are used to make the joints tight and that the union at the meter is screwed tight enough to prevent leaks and yet not so tight as to ruin the connection. A "rate" or outlet cap having an orifice of the proper size to give the required speed of operation to the meter is now screwed to the outlet. When testing at "normal" rate, the outlet cap used is designed to pass a number of cubic feet per hour equal to six times the rated light capacity of the meter. Thus a five-light meter would be tested at "normal" rate with a cap capable of passing $6 \times 5 = 30$ cubic feet per hour. The meter and connections should now be tested for leaks. In order to do this, open the valve connecting the meter to prover and as soon as the air issues freely from the outlet of the meter, close the outlet with the hand. This will impress the prover pressure upon the meter. The valve is now closed and any leak in the meter will be indicated by the pressure gage showing a loss of pressure in the meter and connections. If the leak is in the connections, it may be removed and the test continued; but if in the meter, the latter should not be subjected to further test until repaired.

If no leak is found allow from 1 to 3 cubic feet of air or of other medium used to pass through the meter before commencing the test. This is done in order to allow the meter to arrive at its actual working condition before the actual test is made. With a larger meter more air or gas might well be used, but it should be borne in mind that after a meter has been actually measuring gas for some time, the passage of air through the meter hardens the diaphragms and consequently changes their capacity. It is, therefore, plainly possible to pass too much air through the meter but if gas is used as a testing medium, this trouble does not generally occur to as large an extent.

In the operation described in the preceding paragraph the hand of the test dial should be stopped exactly at a division such that the hand stands in approximately a horizontal position. It is generally preferred to stop the hand during the upward motion. The reason for this is to get rid of the effect of backlash in the recording mechanism.

The prover bell is now raised until its zero mark is above the indicator and then adjusted by means of the circular valve to bring the zero mark just to the indicator. Now open wide the valve to the meter and allow it to remain so until the hand of the test dial reaches exactly its starting point. Record the reading of the meter prover to the nearest one-hundredth cubic foot and from this calculate the error of the meter.

Two methods of calculating the error of a meter are in use.

1. According to the formula—

$$\frac{\text{meter reading} - \text{prover reading}}{\text{prover reading}} \times 100 = \text{per cent error.}$$

2. According to the formula—

$$\frac{\text{meter reading} - \text{prover reading}}{\text{meter reading}} \times 100 = \text{per cent error.}$$

While both methods are correct, the latter formula is probably the best one to use, since it bases the per cent of error upon the meter reading which is the factor upon which bills are based. Also, meter-prover scales are usually so graduated that the per cent of error of meters, if based upon this formula, may be read directly from the scales. Since the first-mentioned method of calculating the per cent of error is also extensively in use a table is added (pp. 104–105) from which the errors may be easily obtained.

If, after a meter has been in service for some time, two or more consecutive tests be made upon it, using air as the testing medium, it will generally be found that those tests after the first indicate that the meter has become faster. The difference between consecutive tests may range from zero to more than 1 per cent. The cause of this is probably as follows: The gas in passing through the meter saturates the diaphragms with light and volatile oils often spoken

of as "condensates." Since the gas is ordinarily more or less saturated with these condensates it has no tendency to reabsorb these oils, but if air is brought into contact with the diaphragms evaporation of the oils immediately commences, with the result that the diaphragms are made hard and stiff and the measuring chambers formed by them will not have the same capacity as before, but will be decreased in capacity, since the testing medium can not by its small excess of pressure over atmospheric smooth out the diaphragm as it did when it was soft and pliable. Thus the first test of a dry meter with air, if carefully performed, probably gives the most nearly correct result and this fact should be borne in mind when "complaint" meters are being tested.

Another result of the evaporation of the condensates in a meter during the passage through it of the testing medium is that the testing medium is increased in volume and as much of this increase in volume will be indicated by the meter the volume indicated by the meter prover is not, as assumed, the actual volume of gas passing through the meter. Thus, unless care is taken, another error is introduced into the test.

Recently experiments have been made[1] in using as a proving medium for testing meters, gas saturated with water vapor and also with the condensates that normally are introduced into the meter and diaphragm. By doing this the following advantages are apparent:

1. In passing the testing medium through the meter, no evaporation of the condensate occurs so that—

(*a*) The volume of the proving medium remains constant.

(*b*) The diaphragms are not dried out and thus successive tests of the same meter agree much better than when using air as the proving medium.

2. The error due to the vaporization of water after the proving medium is introduced into the bell is evaded. The error due to the evaporation from the outside of the bell will remain (unless the means previously outlined to prevent this are adopted).

For testing a meter to show that it will register small quantities of gas, it is customary to connect it to a burner consuming about one-half cubic foot or less of gas per hour. After running it with such a burner for from 15 to 30 minutes, a meter which does not register is easily detected by the failure of the test hand to move. Such testing and that for case leaks is properly part of the meter repair work rather than of the meter testing.

From time to time the Bureau of Standards includes among its publications those pertaining to the testing of gas, gas meters, etc. It is suggested that those interested in these matters should apply for these publications.[2]

The writer desires to express his indebtedness to Mr. R. S. McBride and Mr. E. F. Mueller, both of this bureau, for valuable suggestions in the preparation of this paper.

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[1] Proceedings of the American Gas Institute, Vol. VII, 1912.

[2] Circular No. 48, which is now being published, treats in detail of the testing of gas and gas meters.

VII. PERCENTAGE OF ERROR TABLE.

The percentages given in these tables were calculated from the formula

$$\text{Percentage of Error} = \frac{\text{Meter Reading} - \text{Prover Reading}}{\text{Prover Reading}} \times 100.$$

METER REGISTERING 2 CUBIC FEET.

Delivered by prover.	Error of meter.	Delivered by prover.	Error of meter.	Delivered by prover.	Error of meter.	Delivered by prover.	Error of meter.
Cubic feet.	*Per cent.*	*Cubic feet.*	*Per cent.*	*Cubic feet.*	*Per cent.*	*Cubic feet.*	*Per cent.*
1.70	+17.6	1.88	+ 6.4	2.06	− 2.9	2.24	−10.7
1.71	+17.0	1.89	+ 5.8	2.07	− 3.4	2.25	−11.1
1.72	+16.3	1.90	+ 5.3	2.08	− 3.8	2.26	−11.5
1.73	+15.6	1.91	+ 4.7	2.09	− 4.3	2.27	−11.9
1.74	+14.9	1.92	+ 4.2	2.10	− 4.8	2.28	−12.3
1.75	+14.3	1.93	+ 3.6	2.11	− 5.2	2.29	−12.7
1.76	+13.6	1.94	+ 3.1	2.12	− 5.7	2.30	−13.0
1.77	+13.0	1.95	+ 2.6	2.13	− 6.1	2.31	−13.4
1.78	+12.4	1.96	+ 2.0	2.14	− 6.5	2.32	−13.8
1.79	+11.7	1.97	+ 1.5	2.15	− 7.0	2.33	−14.2
1.80	+11.1	1.98	+ 1.0	2.16	− 7.4	2.34	−14.5
1.81	+10.5	1.99	+ 0.5	2.17	− 7.8	2.35	−14.9
1.82	+ 9.9	2.00	+ 0.0	2.18	− 8.3	2.36	−15.3
1.83	+ 9.3	2.01	− 0.5	2.19	− 8.7	2.37	−15.6
1.84	+ 8.7	2.02	− 1.0	2.20	− 9.1	2.38	−16.0
1.85	+ 8.1	2.03	− 1.5	2.21	− 9.5	2.39	−16.3
1.86	+ 7.5	2.04	− 2.0	2.22	− 9.9	2.40	−16.7
1.87	+ 7.0	2.05	− 2.4	2.23	−10.3		

METER REGISTERING 5 CUBIC FEET.

4.50	+11.1	4.81	+ 4.0	5.12	− 2.3	5.43	− 7.9
4.51	+10.9	4.82	+ 3.7	5.13	− 2.5	5.44	− 8.1
4.52	+10.6	4.83	+ 3.5	5.14	− 2.7	5.45	− 8.3
4.53	+10.4	4.84	+ 3.3	5.15	− 2.9	5.46	− 8.4
4.54	+10.1	4.85	+ 3.1	5.16	− 3.1	5.47	− 8.6
4.55	+ 9.9	4.86	+ 2.9	5.17	− 3.3	5.48	− 8.8
4.56	+ 9.6	4.87	+ 2.7	5.18	− 3.5	5.49	− 8.9
4.57	+ 9.4	4.88	+ 2.5	5.19	− 3.7	5.50	− 9.1
4.58	+ 9.2	4.89	+ 2.2	5.20	− 3.8	5.51	− 9.3
4.59	+ 8.9	4.90	+ 2.0	5.21	− 4.0	5.52	− 9.4
4.60	+ 8.7	4.91	+ 1.8	5.22	− 4.2	5.53	− 9.6
4.61	+ 8.5	4.92	+ 1.6	5.23	− 4.4	5.54	− 9.7
4.62	+ 8.2	4.93	+ 1.4	5.24	− 4.6	5.55	− 9.9
4.63	+ 8.0	4.94	+ 1.2	5.25	− 4.8	5.56	−10.1
4.64	+ 7.8	4.95	+ 1.0	5.26	− 4.9	5.57	−10.2
4.65	+ 7.5	4.96	+ 0.8	5.27	− 5.1	5.58	−10.4
4.66	+ 7.3	4.97	+ 0.6	5.28	− 5.3	5.59	−10.6
4.67	+ 7.1	4.98	+ 0.4	5.29	− 5.5	5.60	−10.7
4.68	+ 6.8	4.99	+ 0.2	5.30	− 5.7	5.61	−10.9
4.69	+ 6.6	5.00	0.0	5.31	− 5.8	5.62	−11.0
4.70	+ 6.4	5.01	− 0.2	5.32	− 6.0	5.63	−11.2
4.71	+ 6.2	5.02	− 0.4	5.33	− 6.2	5.64	−11.3
4.72	+ 5.9	5.03	− 0.6	5.34	− 6.4	5.65	−11.5
4.73	+ 5.7	5.04	− 0.8	5.35	− 6.5	5.66	−11.7
4.74	+ 5.5	5.05	− 1.0	5.36	− 6.7	5.67	−11.8
4.75	+ 5.3	5.06	− 1.2	5.37	− 6.9	5.68	−12.0
4.76	+ 5.0	5.07	− 1.4	5.38	− 7.1	5.69	−12.1
4.77	+ 4.8	5.08	− 1.6	5.39	− 7.2	5.70	−12.3
4.78	+ 4.6	5.09	− 1.8	5.40	− 7.4		
4.79	+ 4.4	5.10	− 2.0	5.41	− 7.6		
4.80	+ 4.2	5.11	− 2.2	5.42	− 7.8		

PERCENTAGE OF ERROR TABLE—continued.

METER REGISTERING 10 CUBIC FEET.

Delivered by prover.	Error of meter.	Delivered by prover.	Error of meter.	Delivered by prover.	Error of meter.	Delivered by prover.	Error of meter.
Cubic feet.	*Per cent.*	*Cubic feet.*	*Per cent.*	*Cubic feet.*	*Per cent.*	*Cubic feet.*	*Per cent.*
9.00	+11.1	9.58	+ 4.4	10.16	− 1.6	10.74	− 6.9
9.01	+11.0	9.59	+ 4.3	10.17	− 1.7	10.75	− 7.0
9.02	+10.9	9.60	+ 4.2	10.18	− 1.8	10.76	− 7.1
9.03	+10.7	9.61	+ 4.1	10.19	− 1.9	10.77	− 7.1
9.04	+10.6	9.62	+ 4.0	10.20	− 2.0	10.78	− 7.2
9.05	+10.5	9.63	+ 3.8	10.21	− 2.1	10.79	− 7.3
9.06	+10.4	9.64	+ 3.7	10.22	− 2.2	10.80	− 7.4
9.07	+10.3	9.65	+ 3.6	10.23	− 2.2	10.81	− 7.5
9.08	+10.1	9.66	+ 3.5	10.24	− 2.3	10.82	− 7.6
9.09	+10.0	9.67	+ 3.4	10.25	− 2.4	10.83	− 7.7
9.10	+ 9.9	9.68	+ 3.3	10.26	− 2.5	10.84	− 7.7
9.11	+ 9.8	9.69	+ 3.2	10.27	− 2.6	10.85	− 7.8
9.12	+ 9.6	9.70	+ 3.1	10.28	− 2.7	10.86	− 7.9
9.13	+ 9.5	9.71	+ 3.0	10.29	− 2.8	10.87	− 8.0
9.14	+ 9.4	9.72	+ 2.9	10.30	− 2.9	10.88	− 8.1
9.15	+ 9.3	9.73	+ 2.8	10.31	− 3.0	10.89	− 8.2
9.16	+ 9.2	9.74	+ 2.7	10.32	− 3.1	10.90	− 8.3
9.17	+ 9.1	9.75	+ 2.6	10.33	− 3.2	10.91	− 8.3
9.18	+ 8.9	9.76	+ 2.5	10.34	− 3.3	10.92	− 8.4
9.19	+ 8.8	9.77	+ 2.4	10.35	− 3.4	10.93	− 8.5
9.20	+ 8.7	9.78	+ 2.2	10.36	− 3.5	10.94	− 8.6
9.21	+ 8.6	9.79	+ 2.1	10.37	− 3.6	10.95	− 8.7
9.22	+ 8.5	9.80	+ 2.0	10.38	− 3.7	10.96	− 8.8
9.23	+ 8.3	9.81	+ 1.9	10.39	− 3.8	10.97	− 8.8
9.24	+ 8.2	9.82	+ 1.8	10.40	− 3.8	10.98	− 8.9
9.25	+ 8.1	9.83	+ 1.7	10.41	− 3.9	10.99	− 9.0
9.26	+ 8.0	9.84	+ 1.6	10.42	− 4.0	11.00	− 9.1
9.27	+ 7.9	9.85	+ 1.5	10.43	− 4.1	11.01	− 9.2
9.28	+ 7.8	9.86	+ 1.4	10.44	− 4.2	11.02	− 9.3
9.29	+ 7.6	9.87	+ 1.3	10.45	− 4.3	11.03	− 9.3
9.30	+ 7.5	9.88	+ 1.2	10.46	− 4.4	11.04	− 9.4
9.31	+ 7.4	9.89	+ 1.1	10.47	− 4.5	11.05	− 9.5
9.32	+ 7.3	9.90	+ 1.0	10.48	− 4.6	11.06	− 9.6
9.33	+ 7.2	9.91	+ 0.9	10.49	− 4.7	11.07	− 9.7
9.34	+ 7.1	9.92	+ 0.8	10.50	− 4.8	11.08	− 9.7
9.35	+ 7.0	9.93	+ 0.7	10.51	− 4.9	11.09	− 9.8
9.36	+ 6.8	9.94	+ 0.6	10.52	− 4.9	11.10	− 9.9
9.37	+ 6.7	9.95	+ 0.5	10.53	− 5.0	11.11	−10.0
9.38	+ 6.6	9.96	+ 0.4	10.54	− 5.1	11.12	−10.1
9.39	+ 6.5	9.97	+ 0.3	10.55	− 5.2	11.13	−10.2
9.40	+ 6.4	9.98	+ 0.2	10.56	− 5.3	11.14	−10.2
9.41	+ 6.3	9.99	+ 0.1	10.57	− 5.4	11.15	−10.3
9.42	+ 6.2	10.00	0.0	10.58	− 5.5	11.16	−10.4
9.43	+ 6.0	10.01	− 0.1	10.59	− 5.6	11.17	−10.5
9.44	+ 5.9	10.02	− 0.2	10.60	− 5.7	11.18	−10.6
9.45	+ 5.8	10.03	− 0.3	10.61	− 5.7	11.19	−10.6
9.46	+ 5.7	10.04	− 0.4	10.62	− 5.8	11.20	−10.7
9.47	+ 5.6	10.05	− 0.5	10.63	− 5.9	11.21	−10.8
9.48	+ 5.5	10.06	− 0.6	10.64	− 6.0	11.22	−10.9
9.49	+ 5.4	10.07	− 0.7	10.65	− 6.1	11.23	−11.0
9.50	+ 5.3	10.08	− 0.8	10.66	− 6.2	11.24	−11.0
9.51	+ 5.2	10.09	− 0.9	10.67	− 6.3	11.25	−11.1
9.52	+ 5.0	10.10	− 1.0	10.68	− 6.4	11.26	−11.2
9.53	+ 4.9	10.11	− 1.1	10.69	− 6.5	11.27	−11.3
9.54	+ 4.8	10.12	− 1.2	10.70	− 6.5	11.28	−11.3
9.55	+ 4.7	10.13	− 1.3	10.71	− 6.6	11.29	−11.4
9.56	+ 4.6	10.14	− 1.4	10.72	− 6.7	11.30	−11.5
9.57	+ 4.5	10.15	− 1.5	10.73	− 6.8		

DISCUSSION.

The CHAIRMAN. One or two of these papers were put upon the program with the idea that sooner or later all the questions of measurement in connection with public utilities are going to be taken up in one place and under one head, as they should be. The question of calibrating meters is no different from other questions with which we have to deal, except in the details; and it is not so complicated or difficult as it might seem at first glance.

UNIFORMITY OF STATE LAWS IN WEIGHTS PER BUSHEL OF COMMODITIES.

By R. W. Smith, *Deputy Commissioner of Weights and Measures, State of Minnesota.*

I first want to give due credit to that very able compilation of State and national laws which is published by the Bureau of Standards for the aid which it has given me in preparing this paper.

The question of bushel weights of dry commodities is one which Minnesota, as well as other States, has been struggling with for some time. One of the official acts of the Minnesota Conference of Weights and Measures, which was held in St. Paul in November, 1912, and which was attended by delegates from a number of other States, was to refer to the Minnesota department the preparation of data relating to bushel weights, and the formation of a tentative plan to secure uniformity between States in this very important matter.

One thing was apparent from the very first, and may be most briefly expressed by changing one word of the subject assigned to me, viz, the variation in State laws in weights per bushel of commodities. Before proceeding further let me cite a few of the more striking examples of this variation. Turnips show a range of from 42 to 60 pounds; timothy seed shows the same variation; such a common and stable commodity as coarse salt ranges from 50 to 85 pounds; pop corn, in the ear, is in one State 42 pounds per bushel—in another 70 pounds; dried peaches may be bought and sold at from 28 to 40 pounds per bushel; and while most States say that lime shall be 80 pounds per bushel, one State fixes the value at 35 pounds per bushel; broom corn seed is in Minnesota 57 pounds per bushel, while in the neighboring States of North and South Dakota it is 30 pounds. I could go through almost the entire list of commodities upon which bushel weights have been established and point out similar variations, some of them not so great as those cited, but all of them equally inconsistent.

Our first question, when considering these discrepancies between States on the weights of the same commodities, is, "In what manner were these weights originally determined?" The answer to this question is not forthcoming and we are forced to conjecture. There are two possible methods: The commodities might have been measured in a container holding one bushel, and the resulting quantity weighed; or the figures might have been determined arbitrarily. To the layman, and indeed to anyone, the first method would seem the only logical one, if our result is to be called a bushel weight; but let us study for a moment a few of the figures upon our statute books, and see whether or not this plan has been followed.

All the States which mention shelled corn fix the weight at 56 pounds per bushel; and in this instance we are safe in saying that the figure thus established is the weight of 2,150.42 cubic inches of shelled corn. With one exception the same concurrence of opinion is shown in the weight of corn in the ear, but the weight in this case is 70 pounds when in reality a bushel of husked corn in the ear weighs not more than 38 pounds. Those States giving a weight on unhusked corn in the ear place the figure still higher, running from 72 to 75 pounds. It would be the height of foolishness to suppose that we

could get 70 pounds of ear corn in a bushel basket; it was evidently the intention of those who established these weights to fix such a value that we would have 56 pounds when the same was shelled, thereby making the shelled condition the basis of their calculations.

We have a different condition when dealing with two particular varieties of small fruits. The weight of cherries is placed, in one State, at 64 pounds when without stems; but with the stems the weight is 56 pounds. Grapes, in the same State, are 60 pounds without stems, and 48 pounds with stems. In these cases the object was apparently to approximate closely the actual weight of a bushel, since allowance is made in each case for the stems.

While the difference between the legal and the actual weights of a bushel of corn in the ear, a difference of 32 pounds, seems unreasonable, still there can be seen some excuse for it; but there are cases where there is no connection at all between actual and legal weight. As examples of this condition I would mention a few instances in which we have proven, by actual tests in our office, that this state of affairs existed. The average weight of rutabagas as established by different States is 50 pounds. Our test shows that the weight should be 57 pounds. The majority of States fix the weight of beets at 60 pounds, while the actual weight is from 53 to 55 pounds. In every case the weight of blue-grass seed, orchard-grass seed, and redtop seed is established at 14 pounds per bushel. This is about the weight of such seed in an uncleaned condition, containing chaff, dirt, and so forth, but clean seed, after exhaustive tests, has been found to weigh not less than 30 pounds to the bushel. All of the States, without exception, which mention peas in their bushel list fix the weight at 60 pounds, without making any distinction between the smooth and wrinkled varieties. After a large number of tests we find the average weight of the wrinkled variety to be only 56 pounds.

So we arrived at the conclusion that while the weight of a measured bushel of a certain commodity was sometimes considered when establishing the legal weight of that commodity, still, in a large number of cases, there is little or no connection between the two. And now our attention is called to another peculiar feature of the bushel laws in this country. We can possibly conceive of this condition—that the weights of the same commodity, raised in widely separated parts of the country, might differ. However, that there should be a difference between adjoining States of from 1 to 30 pounds on the same commodity, seems an utter absurdity. To illustrate: In Minnesota the weight of cranberries is 36 pounds; in Wisconsin it is 35 pounds; onions in Minnesota are 52 pounds; in Wisconsin they are 57 pounds; parsnips are 42 pounds in Minnesota, and 44 in Wisconsin. Conditions of this kind permit a man to buy in one State and sell in another, keep wholly within the law in both States, and still make a nice percentage in addition to his commission; besides this they cause endless confusion for the merchant and grower.

Of course, we must not forget in our discussion the few shining examples of uniformity which we have, such as wheat, flaxseed, and peas, which are the same in every State in the Union. But the fact remains that the first thing a merchant must do if he moves from

one State to another is to acquaint himself with the bushel weights in his new home. And we are forced to admit that there are no two States in which even the majority of the bushel weights are identical.

In striving for a solution of this problem, both to carry out the instructions of the conference mentioned before and to improve our own law, our department prepared a table showing "what the result would be as to the weight per bushel on different kinds of commodities if the weight were based on that amount per bushel as used by the greatest number of States, and where the result shows a tie between several States the weight is arrived at by an average between all States naming a weight per bushel on a given commodity. The weights shown by the Federal Government are listed the same as if they were shown by a State." The table further shows the number of States declaring for each weight per bushel on each commodity. In amplifying and altering our existing bushel list in Minnesota in the legislative session just passed this list formed the basis of our calculations. But irrespective of the instruction of the conference and the majority rule established by them, we were obliged to deviate from this list in certain instances where the figures were manifestly not the weight of a bushel, as shown both by our own tests and the experience of growers in Minnesota. I will call your attention to only a few of the items on this list, giving first the resulting weight when following the plan just outlined, and then the different weights used by the different States for that commodity. These figures will present to you the variation between States in a slightly different manner than what has gone before:

Apples, 48 pounds; seven States said 50 pounds, fourteen States said 48 pounds, one State said 44 pounds, four States said 45 pounds, and one State said 46 pounds.

Broom corn seed, 30 pounds; one State said 48 pounds, one State said 50 pounds, one State said 57 pounds, one State said 46 pounds, three States said 30 pounds, and one State said 42 pounds.

Buckwheat, 48 pounds; eleven States said 48 pounds, eleven States said 52 pounds, one State said 40 pounds, nine States said 50 pounds, one State said 56 pounds, and five States said 42 pounds.

Cranberries, 32 pounds; two States said 32 pounds, one State said 35 pounds, one State said 36 pounds, one State said 40 pounds, and one State said 33 pounds.

Onions, 57 pounds; two States said 50 pounds, one State said 54 pounds, one State said 55 pounds, twenty-one States said 57 pounds, eight States said 52 pounds, two States said 56 pounds, and one State said 48 pounds.

In this case a figure of 57 pounds was found to be much too high in spite of the fact that twenty-one States had adopted that weight, and 52 pounds was substituted on Minnesota's list.

Sweet potatoes, 53½ pounds; seven States said 55 pounds, seven States said 50 pounds, seven States said 54 pounds, three States said 60 pounds, three States said 46 pounds, and four States said 56 pounds.

I think that the figures I have given are sufficient to demonstrate the deplorable lack of uniformity between States in regulating the

weights per bushel of commodities. Could not this conference, representing as it does practically every section of this country, do something to relieve this situation? We look to other countries for suggestions and we see the beautiful French system working smoothly and to the satisfaction of everyone. However, we realize that, while the metric system of weights and measures is legalized in the United States, any action making the use of it mandatory at this time would be, perhaps, premature, and would undoubtedly create an endless amount of confusion, since we would be substituting for our present standards others of an entirely different character. To my mind, the ideal solution of this problem of uniformity in bushel weights may be briefly stated as follows: The abolition of the bushel and its subdivisions and the substitution therefor of an absolute weight unit of 100 pounds. If this were done, we would still be dealing with our familiar standards of avoirdupois weight in trade, and it would be a matter of only a very short time before grower, dealer, and consuming public would be able to think in terms of weight with the same ease and far greater accuracy than in terms of that indeterminate quantity, the bushel weight.

DIFFERENCE IN THE AMOUNT OF A BUSHEL OF A COMMODITY WHEN SOLD BY WEIGHT AND WHEN SOLD BY MEASURE.

By W. C. Haskell, *Superintendent of Weights, Measures, and Markets, District of Columbia.*

Mr. President and gentlemen, I am sure the gentlemen here present agree with me that the country is very much indebted to you, Mr. President, for the interest you have taken in weights and measures matters and legislation, and for the opportunity you give us each year to meet the gentlemen who are interested in this work for an exchange of ideas and experiences, and through you to the secretary of this conference for his untiring efforts and the ready assistance he gives to those who need to call upon the Bureau of Standards for advice or assistance in matters relating to weights and measures?

When we look into the faces of the gentlemen representing the States and cities of this country at this conference, I think we understand why such satisfactory progress is being made in the protection of the public in a more just and equitable sale of commodities. We see intelligence and determination to do their duty fearlessly but courteously, and to meet and pass upon all questions establishing the truth in the weight and measure of commodities.

My understanding, Mr. President, was that the article to be prepared on the subject of "Difference in the amount of a bushel of a commodity when sold by weight and when sold by measure" should treat especially of the sale of elongated vegetables in small measures. Differences in sale by weight and by measure are pronounced in the case of vegetables of this character when sold in peck, half peck, and quarter peck measurements. For the purpose of making comparisons, a peck, half peck, and quarter peck of both sweet potatoes and carrots were purchased in the markets by a person not connected with our department. Carefully weighing the peck, one-half peck,

and one-quarter peck of potatoes and carrots and finding no material proportional difference, we took the weight of a peck of sweet potatoes for comparison and found them to weigh 12 pounds and 7 ounces. The bushel weighed 49¾ pounds. When remeasured by us the peck of potatoes had a crown of 1¾ inches, the bushel 2½ inches, this being the manner in which they are sold in the District of Columbia. When sweet potatoes are sold by weight here, the custom of sale has established 56 pounds for a bushel. The weight of a peck of sweet potatoes in the District therefore should be 14 pounds. Our investigation shows only 12 pounds and 7 ounces, revealing a shortage, by measure, of 1 pound and 9 ounces in the peck and 6 pounds and 4 ounces in the bushel. The potatoes purchased were somewhat dried out and would hardly record a fair average weight, as it is understood that there is a difference of about 6¼ pounds in weight between the time that they are green and four to six months thereafter, and it would seem but just to take the average between 49¾ and 56 pounds—dry and green—separately, which would give us 52 pounds plus, or commercially 53 pounds for a bushel. This would seem to be a fair amount for the buyer and seller. Establishing for comparison, 53 pounds for a bushel, we find that a bushel sold by weight and by measure, would be the difference between 49¾ and 53 pounds, a fair average for the year, which gives us 3¼ pounds, or practically 6 per cent in favor of weight. I am satisfied, and have been for some time, that the only just and equitable method, both for the seller and the consumer, is to sell by weight, and should be the same in all the several States. The trouble and annoyance in interstate trade would then be solved; and, also to be considered, is the filling of the measure with a proper crown, which now is largely guesswork, and would be avoided if vegetables were sold by weight.

The opinion has prevailed that the sale of large and elongated vegetables in small measures was an injustice to the purchaser or consumer, as the space not occupied by the large vegetables was much greater than when smaller kind were used. To satisfy ourselves, we cut the peck of carrots and the quarter peck of sweet potatoes—large and small measures—into cubes of about one-half inch or less, and found that they occupied practically the same space as in their natural form.

When the conference has arrived at a conclusion as to what should constitute the proper weight for a bushel of vegetables, and I trust the sentiment of this conference is that vegetables should be sold by weight, we should concentrate our efforts to obtain national legislation establishing uniform weights covering the several kinds. A law of this character would be of great benefit in interstate trade, and the States which have established different weights doubtless would amend their statutes to conform to the Federal requirements. The sale of vegetables on a sound, practical, and equitable basis would then be assured.

Any member of the conference, who is interested, may see at my office a practical demonstration of these vegetables as measured and weighed, which covers parsnips and other elongated vegetables, the results being found the same as to the fractional measures and weights of a bushel.

DISCUSSION OF THE TWO PRECEDING PAPERS.

Mr. FERNER. I would like to ask Mr. Smith whether, in the actual test that they made, they used the stricken bushel or the heaped bushel; and if the latter, what was the diameter of the bushel measure used with relation to its height.

Mr. SMITH. We tried to approximate conditions in trade as closely as possible. We were working in conjunction with the growers in the matter, and we had their cooperation, and we tried to work under the same approximate conditions as in trade.

Mr. FERNER. You used the heaped bushel?

Mr. SMITH. The heaped bushel, yes; if there is such a thing.

Mr. WULFSON. Mr. Chairman, there is no question that there should be uniformity everywhere. But there is not. Now, is there a remedy for it? The only remedy, it seems to me, is that Congress pass a uniform law. I think a resolution would be in order, approved by this conference, urging that Congress pass a uniform law regulating the number of pounds required to a bushel in every State. If each State is allowed to make laws, what uniformity can there be? We want a remedy, and Congress has the same right to do this as to coin and issue money.

The ACTING CHAIRMAN (Mr. Neale). I think, Mr. Wulfson, that Mr. Smith is pleading the same as you are now, for that very condition, whether through resolution or in whatever way it may be possible—striking perhaps upon the happy thought of weighing.

Mr. MARONEY. Mr. President, I would ask Mr. Smith whether he has any recommendations as to uniformity that we can take back to our States, so that we may ask our legislators to enact a law that will be uniform throughout the country.

Mr. SMITH. I might say in reply to Mr. Maroney that this list which I mentioned as being prepared under the direction of our Minnesota conference was with the idea of getting uniformity in the bushel weights, and the idea was at that time to establish as the weight per bushel for each commodity that weight which the greatest number of States had adopted, or where there was a tie, to take the average of all the States; and this list was prepared as per those instructions. However, my recommendation most strongly is the substitution of the weight unit absolutely, with the abolition of the bushel.

Mr. MARONEY. What I was getting at, Mr. Chairman, was this: Evidently the committee has gone very carefully into the matter as to what would be a uniform bushel of the different commodities sold by measure. There is no question but what we will agree that the hundredweight would be ideal, but it is not going to be changed at once. My idea was that if the gentleman would bring in a recommendation making, for instance, onions 57 pounds to a bushel, or 55, whichever that committee agreed on, then this conference should officially adopt that recommendation, and so on for other commodities; and, if possible, we would have copies of these recommendations to take back with us, and we could recommend them to our different legislatures. In that way we would progress enough to have a uniform quantity per bushel in each State that would adopt the recommendation of this

conference, and later, if we saw fit, use the hundred-pound weight, after getting the uniformity as to the bushel itself.

Mr. FINE. Mr. President, I have listened with a great deal of interest to the remarks of the gentleman from Minnesota in regard to the different bushels. I have made a study of the measurements and bushel weights of Germany and England, and I find that they have uniform measurements for the bushel. Now, suppose we are buying potatoes in the State of Maine. The law requires a certain number of pounds to the bushel. We will assume, for the sake of argument, that they sell potatoes 65 pounds to the bushel. Our Connecticut law is 60 pounds to the bushel. Another State may sell 55 pounds to the bushel. Here is a lack of uniformity. My suggestion for a remedy would be, Mr. President, that we adopt the hundred-pound system. I think that that would be good for everyone—buyers, sellers, and consumers.

The ACTING CHAIRMAN. I would like to say something about the onion proposition, as long as Mr. Maroney mentioned it. Seventeen years ago in the State of Minnesota, onions undefined—all kinds—were 57 pounds, following the lead of many other States. A change was made at that time to 52 pounds, which illustrates just the danger of all the States making their own arbitrary wishes expressed in terms of bushel weights. They are all doing it; and there is no relief until we can get the uniformity suggested here.

Mr. KELLEY. In order to bring the matter formally before the conference, I move you, Mr. Chairman, that a committee of three be appointed to bring in recommendations to have a uniform weight per bushel for the various commodities, and make their report later to the conference and have it discussed properly; and if the conference sees fit, we can adopt it, and adopt it in the form that Mr. Maroney has suggested; that is, take it back as a recommendation to our respective States.

Mr. WULFSON. I second the motion.

Mr. SWEENEY. Mr. Chairman, if it is within the province of the officials of this bureau, it seems to me they would be the proper people to fix a standard for various commodities. I do not believe there is a State in the Union that refuses to enact their recommendations for legislation. I think that matter ought to be left in the hands of the Bureau of Standards. They would know better all the various commodities and the different weights that we have throughout the several States, and if they can not furnish us before we leave here with a list of those, they could do it some time in the future.

I offer an amendment to that motion, that it be left in the hands of the officials of the Bureau of Standards.

Mr. GOODWIN. I want to second that amendment.

Mr. KEACH. Mr. Chairman, I would like to speak for a moment on the amendment. It seems to me that we are wandering a little bit without our compass to guide us. Now, what was the compass laid down for weights and measures in this country, and when was it laid down? When the United States, after the Declaration of Independence, made and promulgated their Articles of Confederation and afterwards their Constitution, Congress was given the power to standardize

two things, among others: namely, money, and weights and measures. And by legislation the standard weights and measures of the country were put in the custody of the Bureau of Standards. Article I, section 8, of our Constitution refers to this power of Congress, and this section is the same to-day as it was when passed. It is very brief, and I want to read to you what it says:

> The Congress shall have power to coin money, regulate the value thereof and of foreign coins, and fix the standard of weights and measures.

Now, they are coupled together. They are twins. I will say, if I may be permitted, without wishing to be egotistical, that I claim to be quite an expert on monetary affairs myself—coinage, etc.—but I am not up very much, I am willing to say, on weights and measures. I have been deputized to come here by the governor of the State of New York, the Hon. William Sulzer, for the purpose of using my brains, to hear what I can, and retain what I can by the minutes that I can make, and go back to the great Empire State and there suggest something; so that when the fall legislature comes in we may enact, this very year, laws in consonance with what this body wants. If this body will appoint a committee of competent men to draft those things—even if we have not the time to pass them here to-day—and submit them to us, I will guarantee that the Empire State will fall right into line and that Gov. Sulzer will sign such a bill.

I want to read here, so that you will all know it and it will go on the minutes, what the governor said in his private letter to me:

> We want you, Mr. Keach, to go there and see if you can possibly assist in bringing about an efficient and uniform law on the subject of weights and measures. Such laws are sadly needed by the American people; and I therefore earnestly hope that your deliberations will be followed by the initiation of measures of every State to carry into effect the plans adopted by you to strengthen the eminently praiseworthy movement for accurate weights and measures—a movement so much in the interest of the multitude of the poor.

Mr. WALLENMEYER. Mr. Chairman, I would like to remind the gentlemen from New York and Minnesota that the variation in the weights per bushel of the various commodities is not the result of ignorance on the part of the State legislatures, except in a few instances, such as where a difference of 18 pounds per bushel in the same commodity is found in adjoining States. A great deal of the difference in the weight per bushel is due to climatic and soil conditions, and also to the rapid evaporation after potatoes and root products are dug. We all know that potatoes weigh more per bushel if raised in the North than in the South, due to a greater density.

Mr. KEACH. Change your price per bushel; that is all.

Mr. WALLENMEYER. I believe, therefore, it would not be advisable to tamper with the weights per bushel at this time, as it is very evident from the sentiment expressed by this conference that the sale of all commodities will soon be governed by weight and the bushel abolished entirely.

Mr. CUMMINGS. Mr. Chairman, it seems to me that the solution of this whole problem would be to eliminate the dry measures altogether. It seems to me that if Congress were to fix standards of

weight and of liquid measure, and provide that all dry commodities should be sold only by weight, that would be the simple solution of the whole problem. We know by experiment that the same dry commodity, the same fruit or vegetable, raised in the different sections of the country will vary, and that the weight of the same commodity raised in the same section at different seasons of the year will vary; so that, regardless of what we may do in attempting to fix a legal weight per bushel for any commodity, there is bound to be a variation anyway. Now, in Massachusetts, in the cosmopolitan cities, in the foreign stores, we do not see any such thing as selling by measure. All dry commodities are sold by weight. And it appears to me that that is a phase of the subject that ought to be considered in adopting any national law—whether it would not be feasible to abolish the use of the dry measure altogether. To my mind, the only justification there is for the continued use of it at the present day is that of trade custom.

Mr. MARONEY. Mr. President, when that amendment was offered by the gentleman from Pennsylvania, and seconded, there was method in the madness of asking the States to take it up. This is not the first year that this conference has been asking for national legislation, and when you have been intimate with some of the members of that committee, whom you know quite well enough to call them by their first names, they will say: "Ed, we are going home; we are up for reelection; your bill has a lot of merit in it, but we will have to pigeonhole it until we are reelected." There is the sum and substance of the inaction of your national legislators in taking care of legislation that ought to be taken care of, for the reason that you are stepping on somebody's toes more or less all the time.

We have a shining example of that in the session of Congress where Congressman Mann offered the so-called Mann bill. Everybody agreed that there was merit in it, and there was so much merit in it that it was taken from here to Connecticut and passed, and it has been in operation there for some little time. But if the gentlemen here in this conference will go home with a uniform rate of measurement on the different commodities of foodstuffs, with the dignity attached to it of being backed by the Department of Commerce, they will not have very much work in their respective legislatures to put that bill through and have it become a law. I know that from practical experience on the package law.

Mr. KELLEY. Mr. Chairman, I would like to state my position in this matter. It is this: I am here as a representative from the city of Bridgeport. The people of the city of Bridgeport expect me to take part in these deliberations and bring back such information as will be of use to us in the future. We are assembled here in conference in conjunction with the Bureau of Standards, and it is my opinion that we ought to bring something back in the way of recommendations that will be of some use to us. I, as a sealer, have to work under the laws of the State of Connecticut. I am regulated by the laws regarding the weights per bushel as laid down by our statutes, and if there is any deviation from the weights laid down for the bushel in the other States, I want to have those laws changed to

conform to those that apply in other States, so that it will make it easier for me in handling the problems coming before me. I still think that my position is right from my standpoint. I may be wrong; it is my first appearance here; but if I am wrong, I am willing to recede.

The ACTING CHAIRMAN. If you and the gentleman who seconded your motion accept the amendment, that the matter instead of being left to the committee of three named by the chair be left in the hands of the Bureau of Standards, they can take up this work for us.

Mr. KELLEY. I am satisfied if the Bureau of Standards will take it up and issue such recommendations, but I still think it would be better to have this committee of three to go into session—we could include a member of the Bureau of Standards in it—and have a report to take back with us. That is what I would like to have.

Mr. BRIGGS. Mr. Chairman, I would call the attention of the gentleman to the fact that in drawing up specifications of a revolutionary character they ought to be thoroughly considered and ample time given to them. Two or three days is a pretty short time to handle a question of that magnitude. Persons who have had experience in matters of that kind realize the amount of work that is necessary, and it is going to take a great deal of time.

The ACTING CHAIRMAN. The amendment will be acted upon first—that the matter be left in the hands of the Bureau of Standards.

The SECRETARY. Before that motion is carried I would like to say that the Bureau of Standards thinks that the establishment of uniform weights per bushel is an impossibility. You are only carrying a name with you; that is all. If you have a weight of 56 pounds, you are going to forget that it is a bushel. You can not make a stated weight of some commodities go into a bushel measure all the time in different parts of the country; and if we maintain the two side by side, there is bound to be fraud. Sometimes it will be sold by dry measure and sometimes by weight. Now, if you are going to abolish the measure, why not abolish the weights that are connected with it, and do as Mr. Smith has recommended and simply say we will sell by weight and not sell by measure at all?

Mr. GOODWIN. Mr. President, as I understand it, the object of these conferences is to get a uniform weight and measure law to govern all the States, so as to get uniformity in legislation for the purpose of protecting the public. Now, there is no better agent to further this end than the Bureau of Standards, which is handling the subject; and I believe this question should be left in their hands to decide which is the best way to proceed to attain this end.

The ACTING CHAIRMAN. I think, Mr. Goodwin, that it will be taken care of.

Mr. RADCLIFFE. Gentlemen, we are trying to mix oil and water. Sell things by weight; do not mix weights and measures.

Mr. EGAN. Mr. Chairman, I do not believe that we ought to adopt this motion. I am opposed to putting upon the officials of the Bureau of Standards a work that they are opposed to that will not finally result satisfactorily in the different States. As I understand it the Bureau of Standards is not in favor of a continuance of the

sale of commodities by measure. Now, then, if that is true, and we believe in it—the gentleman explained it and it is simple—let us, as delegates, urge upon the legislatures of our different States the abolition of the sale of commodities by measure and the adoption of laws providing for the sale of commodities by weight. That is what we want to do. We have authority under the constitutions of our different States to do this just as we have authority under the constitutions of our different States to adopt a certain number of pounds per bushel; and I think that is the simple way of getting out of this subject. I would not adopt a motion putting upon the officials of this bureau work they are opposed to that will simply continue this controversy in opposition to their wishes and to what they think will work out satisfactorily in the end.

I am opposed to the motion.

The ACTING CHAIRMAN. As I understand the matter, the amendment directs the bureau to establish uniformity in weights per bushel?

The SECRETARY. Mr. Chairman, if you pass this resolution referring it to the bureau, the bureau will immediately report and recommend that this conference adopt a resolution in favor of the abolition of the bushel measure and the adoption of sale by weight.

Mr. KEACH. How about liquid measures?

The SECRETARY. Liquid measure will have to remain.

Mr. SWEENEY. Mr. Chairman, if we are to be guided by the suggestions of Mr. Fischer, and if the recommendations he has mentioned will be offered in the event of this motion as amended being carried, what is the sense of placing the matter in the hands of a committee, then? The whole matter should be dropped.

Mr. KELLEY. I would like to ask if I can withdraw my motion.

Mr. SWEENEY. I believe that everything should be sold by weight, but you are going to revolutionize the system that has been in existence in this country, and you must educate the people to that. It would be an utter impossibility in our State to get legislation of that kind through at this time, but I do believe that we can get legislation through making a uniform weight per bushel of all the various commodities that are sold throughout the United States, providing we have a list of those commodities.

Now, then, if the Bureau of Standards does not feel that it is a good thing to do that, there is no necessity, it seems to me, of having a committee act upon it either; because I believe, if it is to be done at all, it should be done by the Bureau of Standards.

Mr. WILLETT. Mr. President, I move you that the motion and amendment be laid on the table.

(The motion was seconded and agreed to.)

Mr. WILLETT. Mr. Chairman, I move that a committee of three be appointed by the chair to draw up a resolution to have this conference go on record as being in favor of selling by net weight.

(The motion was seconded and agreed to.)

Mr. MARONEY. I move that we adjourn, Mr. Chairman.

The motion was seconded and agreed to. Accordingly, at 1 p. m., the meeting adjourned.

FOURTH SESSION (MORNING OF FRIDAY, MAY 16, 1913).

The conference reassembled at 10.30 a. m.

MOTIONS AND COMMITTEES.

The CHAIRMAN. A resolution was passed yesterday providing for a committee to draw up recommendations regarding the sale of dry commodities by weight rather than by measure, and in accordance with that I will appoint the following committee: Mr. Smith, of Minnesota; Mr. Clark, of Massachusetts; and Mr. Goodwin, of Rhode Island.

Mr. DOWNING. Mr. Chairman, if I may interrupt at this moment, as one of the members of the nominating committee, there are one or two things that I would like to bring up at this time.

We find that among the officers of this association there is no treasurer. Now, it may be at some time that we will want to handle funds. Every organization has a treasurer. I wish furthermore to state that the list on the executive committee is now nine. Most of the members of this committee are from the East. Now, the West is vitally interested in weights and measures; we are taking a prominent part in it, and in order to get some of the western members on this executive committee I think that the list ought to be increased. I therefore at this time move that the office of treasurer be included in the list of our officers, and that the list of the executive committee be increased from 9 to 12.

The SECRETARY. I second that motion, Mr. Chairman.

The CHAIRMAN. You have heard the motion and the second. Ordinarily this would mean a change of by-laws and require some reference to the future, but I suppose that in this case, as we have no particular by-laws, that will not be necessary.

The SECRETARY. I was going to make a motion a little later in regard to that.

The CHAIRMAN. You have heard the motion and the second—to increase the membership of the executive committee and provide a treasurer. Are there any remarks?

Mr. MAHONEY. Mr. President, as a representative of the State of Tennessee, I would like to have the South recognized, and I should be glad to see Mr. Richardson on that committee.

Mr. DOWNING. Mr. Chairman, it was not my idea simply to include the West here; it was my idea to have the executive committee include all sections of the country.

Mr. RICHARDSON. Mr. Chairman, I will state that while I am not hankering for office or for too much hard work, still I would like to have one member of that committee from some one of the Southern States. There are other gentlemen here who are thoroughly capable of representing that section.

The CHAIRMAN. I think you can trust the nominating committee to arrange all that.

The question was taken and the motion was agreed to.

The SECRETARY. Mr. Chairman, I move that the present committee on constitution and by-laws be dismissed—I do not think any of the gentlemen are here at the present time, and some of them are completely out of the weights and measures business—and that a new committee be appointed.

The motion was seconded and agreed to.

The SECRETARY. I would also like to move at this time that a committee on resolutions be appointed to bring in whatever resolutions anyone desires to submit, in order that they may be in proper form.

The motion was seconded and agreed to.

The CHAIRMAN. I will appoint as the committee on constitution and by-laws, Messrs. Rinehart, Woolley, and Hand; as the committee on resolutions, Messrs. Mikesell, Downing, and Albrecht.

TESTING OF WATER METERS.

By W. F. STUTZ, *Assistant Physicist, Bureau of Standards.*

I. INTRODUCTION.

The object of this short paper is briefly to describe and illustrate the more commonly used types of cold-water meters, their principle of operation, and the method of testing them, with particular reference to the meters of small capacity for the measurement of water for domestic service. Meters of larger capacity will be very briefly described.

Fifty years ago the water meter was primarily a scientific measuring instrument. Twenty-five years ago it had only a very limited commercial use. The water meters now in service, working every day, are literally numbered by millions and the number is constantly increasing. One firm alone has sold over a million of these instruments.

Their field of usefulness in engineering practice is varied. To cite one example, the amount of water evaporated by the boilers in a steam-power plant is a very necessary quantity for the engineer to determine in the economical operation of his plant. But the great majority of these millions of water meters are, of course, used by municipal water companies in the sale of water to consumers, principally for domestic use.

The reason for this large increase in the use of meters is twofold: (1) The meter has proven itself an instrument of economy, and (2) it furnishes an equitable basis for charges for water service.

When water was sold under a flat rate, as was formerly the general practice, the consumer, for a particular service, paid the same amount of money whether he used little or much; he naturally used much. With metered service if he uses little he pays little, and if he uses much he pays much; he naturally wastes little.

Comparative figures from a number of cities operating under the flat rate or with few meters, and from an equal number of cities where most of the taps are metered, show an average per capita consumption of water for the metered cities less than one-third as great as that of the cities using the flat rate. The difference is largely to be charged to waste. The meters further furnish a check for the waterworks superintendent of the amount of water pumped against the amount of water sold and show up leaks in the distributing lines. As for the second point, the consumer has a right to demand that he pay only in proportion to the amount he uses and that that amount be correctly measured.

II. TYPES OF METERS.

There are a number of different types of meters on the market adapted for different conditions of service, depending on the amount and nature of the flow to be measured, whether it be comparatively steady or subject to wide fluctuations. Some of the principal types will be briefly described. They may be grouped according to their principle of operation into four types: (1) Positive displacement meters, (2) current or inferential meters, (3) proportional meters, and (4) meters of the venturi type.

1. POSITIVE DISPLACEMENT TYPE.

Probably 75 per cent of all meters sold are of five-eighths inch and three-fourths inch in size—classified by the size of their pipe connections—for measuring flows up to about 20 and 35 gallons per minute, respectively, and are used for domestic service. They are expected to measure all flows great and small, up to this maximum, and all except the very smallest with an accuracy within about 2 per cent. For this class of service because of its accuracy in measuring small quantities of water the positive displacement type is particularly suited and very generally used. This type measures water by repeatedly filling a chamber, or chambers, of fixed size from the supply line and emptying it into the discharge line and counting the number of times the operation is performed—like measuring the contents of a barrel by drawing the water in a pail and counting the number of pailfuls. There are four essential parts: A case, a measuring chamber with a moving piston, a recording register, and a transmission device communicating the motion of the piston to the counter.

(*a*) *Reciprocating piston.*—The reciprocating-piston meter is of this displacement type. It operates on the well-known principle of a duplex pump. Instead of the pump moving the water the water drives the pump. Two cylinders fitted with pistons are mounted side by side. The chambers in the ends of the cylinders are alternately connected with the supply and discharge lines, by valves automatically operated by the pistons and at each four strokes the counter is moved by a lever resting on one of the pistons. This style of meter is no longer extensively used for this class of service.

(*b*) *Rotating piston.*—A second style of positive displacement meter is the rotating piston form. In this style the moving part or piston has the form of a toothed wheel lying flat in a chamber of larger

diameter with recesses around the outer walls corresponding to the teeth in the wheel and with which they mesh, like internal gearing, the wheel moving around the outside wall. This style is similar in its action to the piston and plunger type, the teeth on the wheel corresponding to plungers and the recesses in the case to cylinders. The ends of the passages from the supply line to these compartments, and from the compartments to the discharge are grouped in a circle in the heads of the chamber and the connecting passage between them is in the piston wheel itself, which automatically opens and closes them at the proper time, performing the functions of a slide valve. A pin in the center of the piston causes a shaft to revolve, operating the counting mechanism through a train of gears.

(*c*) *Oscillating piston.*—A third style is the oscillating piston form. In this style the measuring chamber is circular in shape with a rectangular cross section. A partition, on a diameter, on one side connects the two walls. The water inlet is on one side of this partition and the outlet on the other, so that the water in its passage through the meter flows completely around the chamber. The piston is of the form of a split ring of cylindrical shape, the slot in the ring fitting loosely over the partition. The piston is always in contact on a line with both the inner and outer walls, dividing the measuring chamber into four compartments, into which the water is alternately admitted and forced out. The motion of the center of the piston is in a circle. The piston itself sliding on the partition does not rotate but oscillates, the motion being similar to that of an eccentric strap.

(*d*) *Disk.*—A fourth form and one very commonly used is the disk meter. In this style the piston is in the form of a disk. Its motion is that which a coin has, which has been spun on a diameter and when its energy is nearly spent falls on one side and tilts around its periphery, a motion of nutation. The piston is suspended by a ball and socket bearing in a chamber which conforms to the geometrical solid generated by its motion. The chamber is divided by a partition which passes through a slot in the disk. On one side of the partition is the inlet and on the other side the outlet so that the water passes completely around the chamber. The piston is confined in its motion by a roller on a central stem. The disk bearing on a line against the top and bottom of the chamber divides it into four compartments which are alternately filled and emptied. The nutations of the disk are communicated to the counter by an intermediate train of gears.

2. CURRENT OR VELOCITY TYPE.

For the measurement of large volumes of water flowing at comparatively high velocities the displacement type of meter becomes too cumbersome and expensive and offers too great a resistance to the flow, and other types are resorted to. Of these the velocity or inferential type is a common form. It is virtually a small impact turbine. The water in passing through the meter flows through a wheel or propeller to which it imparts a motion of rotation. The rotation of the wheel is transmitted to a counting mechanism and register. The speed of rotation is taken as a measure of the velocity of flow and from it of the quantity.

3. PROPORTIONAL TYPE.

Proportional meters measure large flows by dividing the stream, part of the water being diverted through a small pipe. A meter of the displacement type measures the flow through the small pipe but, from this portion, registers the total flow. The advantage of this arrangement is that the meter offers almost no obstruction to the flow of water through the main line.

Special forms of meters are made in which a combination of types already described are used to secure the advantages of each. One such special form is the compound meter. It consists of a meter of the displacement type and a meter of the velocity type in the same case, the water being automatically diverted through one or the other according to the quantity flowing. Another special form is the detector meter which combines a displacement meter and a proportional meter. It is designed for service on a line which supplies water for both service and fire uses. A displacement meter is mounted in a by-pass on the main line around a differential check valve which, under usual conditions of operation, keeps the main line closed. The water then flows through the by-pass and service meter, but in case of fire when large quantities of water are drawn, the check valve opens and the water flows through the unobstructed main line, a second meter of the proportional type registering as long as the main line is open.

4. VENTURI TYPE.

We come now to the measurement of very large quantities of water, for example, in aqueducts, conduits and main supply lines, where the fluctuation of flow is not extreme. For this service the Venturi type of meter is used. It has no moving parts and practically causes only a temporary loss of head. It is esentially merely a section of the conduit or pipe having a smaller diameter than the rest, with a funnel-shaped approach and downstream section. The difference in velocity in the section of smaller diameter, or the throat, and the upstream section of full diameter, gives rise to a difference in static pressure which is taken as a measure of the quantity of water passing. The register is some form of U tube, or elaboration of this form of manometer.

The meters in the Catskill aqueduct to supply the city of New York are of this type, built in the main conduit and of the same materials as the conduit itself, reinforced concrete. They are intended to measure about 500,000,000 gallons per day.

III. METER REGISTERS.

Water meters usually read in cubic feet, sometimes in gallons. There are two types—the straight-reading register, in which the separate figures appear on a line and are simply read off; and the more usual type, a series of dials, such as used on gas meters, in which each separate figure entering into the total reading is taken from a separate dial. The number above each dial indicates the total quantity for one complete revolution of the pointer, and each subdivision represents one-tenth of that amount.

IV. TESTING OF WATER METERS.

The method of testing water meters is simple and obvious. A quantity of water is passed through the meter, measured, and checked with the reading of the meter. Most meters are provided with a separate dial for this purpose, one complete revolution of the pointer of which corresponds to one cubic foot in the smaller sizes. The most satisfactory and accurate way of testing small meters is by weighing the water passed through. A convenient and simple apparatus for this purpose consists of a tank to receive the water, mounted on a platform scale, a discharge pipe from the meter into this tank, fitted with a head provided with openings of different diameters, any one of which may be connected into the discharge pipe, to secure the desired rate of flow, a quick-opening valve to start and stop the flow of water, a device to easily connect the meter into the supply line; and a gauge to record the pressure. Provided with such an apparatus, the procedure is as follows: The meter having been connected into the line, a quantity of water is allowed to flow through the meter to make sure it is working freely and to expel all air from meter and pipe. Then, the proper size orifice having been opened in the discharge—say a five-eighths inch orifice for a full-flow test on a five-eighths inch meter—the meter is read and the valve opened, allowing the water to flow through the meter, the time of opening being taken. When a predetermined amount has passed, say 10 cubic feet, the valve is quickly closed and the time of closing recorded. By reading from the scales the weight of water in pounds and dividing by the weight of 1 cubic foot, we have the quantity in cubic feet actually passed through the meter to check against the meter reading and determine its error. The error of the meter is usually expressed in per cent of the true quantity delivered. Dividing the cubic feet delivered by the difference in time in minutes, we have the rate of flow in cubic feet per minute. The process is repeated for as many fractional rates of full flow as we wish to determine.

The meter registers volume, and we are testing by weighing the water in pounds. Using cold water from the city mains for testing purposes and using a value of 62.4 pounds for the weight of a cubic foot of water, with fluctuations in temperature between, say, 40° F. and 75° F., it is not necessary to take account of the temperature of the water except in very exact work. Say the water is at 75° F. and we have used the value 62.4, the error from the use of this figure will be about two-tenths of 1 per cent and for lower temperatures still less. For practical purposes the water may be considered as incompressible, and no account need be taken of change of volume with pressure.

Meters are sometimes tested by connecting a portable test meter whose error is known into the service line, allowing the same water to flow through it and the meter to be tested, and checking the reading of the latter against the former. When the capacity of the meter becomes so large that the weighing of the water becomes impracticable, the quantity of water registered by the meter is checked by measuring the actual flow by means of a weir or by discharging into a reservoir of known capacity.

DISCUSSION.

The CHAIRMAN. With regard to this paper and the one we had yesterday, I would say that the whole matter is not nearly so difficult as it seems. Our reason for putting in these papers is that in many new places where the work is just being organized, the work of testing the water meters and gas meters will be taken up by the weights and measures department. The apparatus is simple; it is nothing to be feared, and the bureau will maintain apparatus for instruction, and welcome here at any time those who wish to be instructed in that sort of work. Both of these papers—in order to make them complete, I suppose—have dealt with a wide variety of apparatus and apparatus of larger sizes. Take this last paper; very simple apparatus will handle all the meters used in ordinary service work in any city; and those are the things in which you are interested. The large meters and other things would have to be handled, perhaps, in another way. The water and gas meters are just as important as weights and measures of any other sort; and, as I said yesterday, when this is thoroughly recognized, the subject of weights and measures will mean much more than it does now.

DESIGN AND CONSTRUCTION OF SCALES.

By A. BOUSFIELD, *Chief Engineer E. & T. Fairbanks & Co.*

Mr. President and gentlemen, in preparing this paper on the design of scales the writer merely endeavored to present some of the broader principles underlying all scales, without attempting to describe or illustrate any of the minute details of any particular type of construction. I have entirely omitted automatics and springless dial attachments. Such great development has taken place in these two types of machines recently that they seem worthy of a separate paper. The paper can therefore be regarded almost as an introduction to the subject of scale design.

During the past few years it has been the writer's privilege to study the design and construction of scales and weighing mechanisms, and particularly those adapted to railroad use.

From about 1833 to 1870 great activity was shown in the development and perfection of scales and weighing mechanisms, and numerous patents were granted during this period, and then the pendulum seems to have swung in the other direction, and the time and attention of the manufacturer appear to have been absorbed in producing large quantities of the old models and assuming that these were wholly adequate to meet current demands.

In the meantime the railroad companies were rapidly increasing the carrying capacities of their cars. Freight tonnage was also rapidly increasing, thus necessitating the quicker handling and weighing of freight cars.

The Hepburn act of 1906 placed the responsibility for the weight of the carload at its destination with the railroad originating the freight.

All these factors compelled the railroad companies to give more consideration to their weighing equipment and to demand more refined and accurate machines for doing their work.

The manufacturers, in their efforts to meet these demands, strengthened their old type of scale and also increased the length of knife edge in the main levers; retaining, however, the old form of construction. The past few years, however, has seen great activity in new and original designs, particularly in track scales.

On a busy railroad system, in order to expedite the movement of freight, it is a great advantage to weigh the freight cars in motion, and in order to do this successfully the lever system of the scale must be sufficiently heavy to resist without undue deflection the effects of the moving loads. The platform should have perfect freedom of motion in both planes and should be so constructed that if it is moved slightly from its normal position it will return promptly to position and balance.

Theory and practice are both agreed that the suspension or pendulum system of scale construction is the most accurate and refined that has yet been evolved.

For heavy track-scale construction, and particularly when motion weighing is in vogue, the suspension or pendulum type of scale has undoubted advantages over the old rigid bearing type.

All scale design is based upon the basic principle of the lever. The first and second orders of levers are extensively used in scale construction, but the third order—i. e., where the power is applied between the ends—is seldom used.

Before commencing to design a scale, the designer should be thoroughly conversant with the most advanced practice, so that he will not attempt to experiment with types of construction which have proven unsatisfactory in the past.

There are three distinct types of levers to be considered, viz, straight-line solid-lever type, straight-line trussed, and pipe or torsion levers. All these types possess individual merit as applied to particular instances.

The straight-line solid-lever type is particularly well adapted to track-scale work, where great rigidity is an all-important feature.

The straight-line trussed-lever type is well adapted to wagon scales, where the platforms are large and the capacities light. A long lever is required, and economy of material can be secured by the use of truss rods.

Pipe or torsion levers are well adapted to scales which are to be applied to hopper and charging cars. The principal objection to this type of lever is that for heavy capacities the cylindrical portion has to be made very large and heavy in order to resist the combined bending and torsional strains introduced by the loading. A fault frequently met with in the design of this type of lever is the short fulcrum used. The short fulcrum is used so as to get a high multiplication and thus reduce the load on the splices and the extension levers and thereby cheapen construction.

A slight amount of unequal wear on the pivots in a lever with a short fulcrum and a high multiplication very quickly introduces serious inaccuracies in the scale.

If, however, long fulcrums are used and the bending and torsional stresses kept low, rigid and accurate scales can be designed and built with pipe levers. The tendency, however, in competitive business is to stress the material well up to the elastic limit and thereby reduce the weight of the component parts of the scale as much as possible.

In designing scale levers it is necessary not only to consider the safe working stresses to which the various materials used may be subjected but the deflection of the levers under load must also be considered, as one of the sources of error in a scale is the elasticity of the material, because bending and twisting of the lever system tends to change the multiplication and produce alterations in the state of equilibrium. For this reason all parts of a scale must be made of sufficient strength to resist the effects of any appreciable strain. This feature should be carefully watched in scale design, for if the sizes of important members are reduced, so as to produce excessive stress, accuracy will be materially sacrificed when the scale is loaded to full capacity.

Cast iron is the material most extensively used in the construction of scale levers. This is due to its cheapness and the ease with which it may be worked.

The properties and strength of castings depend upon the quality of the ores and the method of their manufacture in both the blast and the cupola furnace. Long-continued fusion improves the quality of the product, as also do repeated meltings. The percentage of carbon in cast iron is a controlling factor which governs its strength, particularly that percentage which is chemically combined with the iron. Medium-quality castings have an ultimate tensile strength of from 16,000 to 20,000 pounds per square inch, while the elastic limit in tension is about 6,000 pounds per square inch. The modulus of elasticity ranges from 12,000,000 to 18,000,000 pounds per square inch.

The above figures assume that the castings are well designed, with a proper distribution of metal, so that they have not been subjected to the bad effects of cooling strains. It is therefore desirable to keep the stresses in cast-iron scale levers down to at least 3,500 pounds per square inch in tension.

Pivots and knife edges may be considered as infinitely small rollers rolling upon their foundations or bearings. Either a perfectly flat bearing or one whose surface is formed by a large radius is better than a sharp V bearing; because with a sharp V bearing, an element of friction is introduced, due to the effect, however slight, of sliding friction. In some types of special construction, however, the V bearing is a necessary evil. The correct angle for knife edges and pivots has never been very definitely determined. The angle of 90° gives good results for heavy loads, but for scales of light capacities a sharper angle is desirable, and for scales up to 150 pounds capacity may be 45°. The angle of 60° is extensively used by European manufacturers for light scales. The end to be aimed at in establishing the correct angle for pivots and knife edges is to determine the angle which will enable the pivot to support the greatest load with a minimum of wear under all conditions. There is a general agreement among scale designers that the greater the load the greater should be the angle of the pivot or knife edge.

The bearing pressure per linear inch of knife edge has an important bearing on the enduring accuracy of the scale. Loads of 8,000 pounds and 10,000 pounds per linear inch of bearing surface have been used, but a load of 5,000 pounds per linear inch will be found sufficiently high for scales subjected to the effects of heavy loads in motion.

The material used in the construction of pivots and bearings is all important.

For fine scales and precision balances, agate is used to good advantage for the bearings. It is exceedingly hard and takes a fine finish.

The material almost universally used for knife edges, pivots, and bearings is steel, with the exception of agate, as above mentioned.

The ideal condition for pivots and bearings is that the contact surfaces should be extremely hard, while the remainder of the structure retains toughness and ductility, so that the process of hardening pivots and bearings can not be given too much care and attention. As the knife edge or pivot simply rests upon its bearing, means must be provided to prevent lateral displacement. Contact plates which are introduced for this purpose should be arranged whenever possible, so that the point of contact is at the pivot edge. This insures that when rotation occurs, the friction or contact point on the pivot does not describe an arc of any appreciable magnitude, as this would tend to introduce friction. This feature is most important in beams, because the magnitude of rotation in the beam is greater than in the other levers of the scale. The multiplication is always highest at the beam, so that any friction introduced at this point materially affects the accuracy of the scale. If the contact occurs at the ends of the pivot they should be beveled off, so that the knife edge itself becomes the longest line of the prism. Whatever arrangement of contacts is used, care should be taken to see that one is pointed and the other flat, for if two points are used there is a danger when rotation occurs of their becoming locked; that is, one may pass the other and thus produce more friction than if they had not been used at all.

The manner in which the load is applied to a system of scale levers is an all-important feature in design, in order to secure perfect freedom for the platform and at the same time not introduce undue wear upon the pivots and knife edges. The suspension system effectively fulfills this function. The mechanical details of construction in suspension-bearing scales of recent design differ widely, but all aim or should aim to place the suspension of the load below the pivot line and also secure freedom of motion in both planes. In a properly designed suspension bearing perfect freedom of motion is attained without movement of the lever system. The arrangement should be such that if the platform is moved slightly from its normal position, whether laterally or longitudinally, either as a whole or at one end only, it will return promptly to position and balance.

In the suspended type of construction, limit checks are all that are necessary; that is, checks which will merely restrict the movement of the platform within tolerable limits. In other words, if the vertical alignment in a suspension-platform scale is disturbed it will naturally tend to return to its normal position, and the function of

the check is merely to prevent excessive displacements, which in track scales may be caused by the disturbing action of moving cars, or in dormant scales, by trucking over the platform. When rigid bearings are used in scale construction and the whole lever system suspended and allowed to swing, there must always be more or less grinding and scraping of the bearings on the knife edges. This movement may be infinitely small, but it possesses an intensity very destructive to both pivots and bearings, causing wear with consequent friction.

LEVER DESIGN.

In designing levers for scales which are subjected to severe shocks due to the effects of moving loads, an allowance of 100 per cent for impact should be made. So that, having established the maximum working stress which is to be used, the levers should be stressed to only half this amount when the actual capacity is considered. It is poor practice to stress the material up to the elastic limit, for when this is done undue deflection is introduced which will probably cause inaccuracies when the scale is loaded to full capacity.

Excessive deflection of scale levers is one of the serious defects frequently met with in design, and calculations should always be made to determine deflection before allowing construction work to be started. In levers for heavy scales it is desirable that the pivots and knife edges should all be reinforced by projections cast integral with the lever. This construction reduces the bending moment in the pivot steel and is much more preferable than to allow the pivot to project beyond the side of the lever without any support. In scales of light capacity, however, the reinforcement is not so necessary; as, for manufacturing reasons, the pivot is of necessity sufficiently large to resist any bending strains imposed upon it.

In levers where the arc of movement is large, it is very desirable to have the pivots placed on the neutral axis of the section. This insures an equal distribution of mass about the pivot line and enables the lever to work under ideal conditions. When deciding upon the cross section of a lever, the distribution of metal should be arranged so as to withstand lateral as well as vertical strains, and where levers will be subjected to the effects of eccentric loading, the torsional strain should be carefully considered.

SCALE PLATFORMS.

The supporting members of scale platforms should be designed so as to be sufficiently rigid to eliminate excessive deflection, which tends to throw unequal loading upon the scale mechanism. When these members rest on two points of support, the calculations are easy, for when reduced to their elements they are simple beams supported at two ends and subjected either to a distributed or a series of concentrated loads. When more than two points of support are used, however—as in a track scale of more than two sections—the calculations for bending movements become more complicated. The case is that of a continuous girder subjected to the effects of a series of concentrated and moving loads.

For track-scale bridges over which locomotives are likely to be run, it is well to design these for one of the various classes of Cooper's standard bridge loading, adapting the class to the type of locomotive used by the railroad installing the scale.

The effect of running coupled cars over the weighing rail of a scale should also be considered. Under this condition a load equal to four times the individual axle load is concentrated upon a span of 17 feet 6 inches.

The capacity of a standard freight-car axle with journals 5½ by 10 inches is 40,000 pounds. Therefore we have to consider a load of 160,000 pounds concentrated upon a span of 17 feet 6 inches.

Recent development in transportation problems have made it necessary to consider the building of heavier freight cars, and the Master Car Builders' Association have approved of the design for an axle with journals 6 by 11 inches with a capacity of 50,000 pounds for use under freight cars, and if these cars come into general use railroad track scales will have to be designed of sufficient capacity to weigh them accurately in motion.

SEALING LEVERS AND BEAMS.

There is nothing of greater importance in the manufacture of scales than the sealing of the levers and beams. This must be done with the greatest of care and accuracy, and levers of large capacity should be sealed with test weights as heavy as it is practical to handle. If light test weights are used in sealing, there is a great danger of the levers being inaccurate when loaded to full capacity. It is almost impossible to detect slight discrepancies with light test weights.

If the lever is fitted with a nose iron, its position should be carefully marked, so that if it is changed by rough handling in shipping it can readily be reset to its true position. The field man will readily recognize the importance of this.

The notching and marking of beams is an operation of precision, and it is almost impossible to obtain or manufacture a machine of sufficient accuracy to do the work without final sealing by a skilled workman.

The beam must be accurate, for all the care in design and manufacture of the other parts is thrown away if this part is not carefully and accurately made. This is more particularly true where the multiplication of the lever system is high, as in a track scale.

The usual practice in track-scale construction is to carry the multiplication at the butt of the beam to about 800. In some special instances it is kept as low as 400; then, with a multiplication of 10 in the beam itself, it can readily be seen that great accuracy is necessary to give correct weights.

ERECTION AND TESTING.

The correct erection of a scale is just as important as its design and manufacture. Small self-contained scales—such as balances, markets, trips, and counter scales—are arranged so that there is little

chance for incorrect assembling if ordinary intelligence is used. The subject, therefore, of erection and testing may be confined to the larger units, such as wagon, hopper, and track scales.

A good foundation is of vital importance for the correct working of a scale of the above-mentioned type. When the scale is of the pit pattern, cement concrete is the material best adapted to a foundation. The supports or piers for the lever stands should be very carefully leveled and the foundation bolts accurately set.

When installing the scale, great care must be exercised in order to have all the levers level and all connections plumb. All checks should be carefully examined to see that they do not bind the platform. Checks in a scale are a necessary evil. In rigid-bearing types they are necessary to hold the platform in position, as loads are run on and off; with proper care, however, the limit of disturbance can be held very low. In suspension or pendulum types they are used more as a limit check, as the platform will naturally return to its correct position after displacement, and the checks merely insure that displacement will not exceed tolerable limits. Checks of whatever nature, however, will always introduce more or less friction, which is the enemy of all scales, and it is of vital importance that the erector should use very great care in adjusting check rods. Another point that must be closely watched is to see that all pivots and bearings are taking their proportion of the load. This is of great importance in scales where the load is supported on a number of sections as in a track scale, for if one of the main levers is loose, a hammer blow will be delivered to the knife edge, which is very disastrous to its life and also impairs the accuracy of the scale. For pit scales good drainage is very necessary as dampness and consequent corrosion very quickly impair the accuracy of the scale. It is impossible to get correct weights from a scale whose pivots are badly rusted.

After the scale has been erected and all the component parts are in position, a thorough inspection should be made by the erector to see that all connections are free and perfectly plumb, that pivots and knife edges are properly seated in their bearings, and that all levers are tight and in position to take their proportionate share of the load. After the erection of a scale it should always be tested to as near full capacity as practical.

In the case of wagon scales this is not always easy, as it is difficult to transport the requisite number of test weights to isolated points.

Track scales are readily tested by means of test cars, which should have a maximum capacity sufficiently great to place a load on each section equal to the load it will receive in actual service. The test car should be made with a short wheel base so that its total weight can be concentrated between the two sections of a track scale. When a master scale is not available, it is a decided advantage to have the car arranged to carry sufficient 50-pound test weights to equal at least the net weight of the car.

When the car is built in this way, its accuracy can be proven without the aid of a master scale, and in the case of a dispute the proof may be established in the field, and at the scale which is being

tested, without having to run the car to some terminal point where a master scale may be located.

When it is found that adjustments are necessary in order to make the scale weigh correctly, such adjustments should always be made by an experienced erector or scale mechanic, as this work requires care and skill, and the uninitiated will usually make the scale worse instead of better if attempts at adjustment are made.

In testing grain hopper scales of large capacity such as 2,000 bushels, the following method of procedure will give good results. Suspend a temporary framework from the scale platform framing and place 2,000 pounds of test weights on each corner successively, testing the beam after each corner has been loaded. When the loading of the last corner has been completed, a load of 8,000 pounds of test weights will have been placed upon the scale.

Then run grain into the hopper until the full capacity has been reached. Rebalance the scale and remove the weights from each corner separately, checking each corner as it is respectively unloaded. Grain hopper scales work under almost ideal conditions, as the loads are gradually and steadily applied and removed, the grain flowing in and out in a steady stream. With reasonable care in handling and operating very accurate results can be obtained.

MOTION WEIGHING OF FREIGHT CARS.

When track scales are used for motion weighing, it is necessary to place the weighing rail upon a grade; the amount of grade used has a direct bearing upon the motion of the cars over the scale. The main object is to attain a nice easy motion of the cars and to avoid impacts both on the scale and in the classification yard.

Experience has demonstrated that a grade of 0.75 per cent will give good results. This grade should be established in that portion of the scale bridge located above the main bearings, as it is essential to keep the scale mechanism level. Grade blocks may be placed above the main bearings and all the ties and rail stands be kept the same height, or the grade may be formed in the crossties or by varying the height of the rail stands. In recent years a decided advancement has been made in the construction of platforms for high-grade track scales used by railroads. Instead of using an exposed floating platform, a rigid deck construction is used, the weighing rail being supported by rail stands resting either directly on the main longitudinal girders or on crossties. These stands pass up through the rigid deck and support the rail, so that instead of the whole platform being supported on the scale and exposed to all disturbing elements only the rail is exposed. Another distinct advantage of this construction is that protective overlap may be used at each end and the load applied at a point beyond the center line of the first section. This feature eliminates all tendency of the platform or rail to tilt as cars or locomotives enter upon the weighing rail. If the protective overlap is carried sufficiently far, it also tends to distribute the load between the first two sections and preserve the life of knife edges in the first section.

RECENT HEAVY CONSTRUCTION.

What is probably the largest and heaviest track scale in the world has recently been constructed for the Norfolk & Western Railroad. This scale is 68 feet long and is made in four sections. Five foot six inch protective overlap is used at each end, thus giving a 57-foot weighing rail. The main lever stands are placed directly upon the concrete foundation and all pocketing of piers is eliminated. The scale is equipped with dead rails which are supported upon heavy transverse girders. It is also furnished with flexible rails in order to bring the load gradually on to the lever system.

The scale is built on 0.75 per cent grade obtained by the use of grade blocks placed under the main girders. The main girders are designed as a box chord, and are made in three sections, so as to eliminate the objectionable upward reaction of the extreme ends which is experienced in a continuous girder. These girders are designed so as to give a maximum stiffness both vertically and transversely.

The main levers are cast steel, with the load and fulcrum pivots 15 inches long and with the tip pivots 7 inches long. The end extension lever is 14 feet 8 inches long, with 22-inch fulcrum, with the load and fulcrum pivots $2\frac{1}{4}$ inches square and arranged so as to give a bearing of $6\frac{1}{2}$ inches at each side of the lever. The pivot in the tip nose iron is of the continuous knife-edge type arranged with 5-inch continuous bearing surface.

The middle extension lever is 18 feet long with $13\frac{1}{2}$-inch fulcrum. The load and fulcrum pivots are $2\frac{1}{4}$ inches square.

The fifth lever is 10 feet 6 inches long with $13\frac{1}{2}$-inch fulcrum. The load and fulcrum pivots are 2 inches square, and the tip nose iron pivot is of the continuous knife-edge type. All pivots in the levers are heavily reenforced, so as to guard against all bending strains. The multiplication of the lever system is as follows:

Main levers multiple, 3;
Extension levers multiple, 8;
Fifth lever multiple, $8\frac{1}{3}$;
Shelf lever multiple, 2;

thus giving a multiplication of 24 at the tip of the extension levers, a multiplication of 200 at the tip of the fifth lever and a multiple of 400 at the butt of the weighing beam. The main lever and extension lever stands are placed directly on the concrete. The extension lever stands are furnished with loose rocker steels, so as to maintain a full line contact with the pivot edges at all times.

A system of tranverse and longitudinal bracing composed of heavy cast-iron I-beam sections is provided for connecting the main and extension lever stands.

This bracing is connected by means of heavy flanges cast to the main lever and the extension lever stands.

The main bearings are of the suspension type, arranged so as to give perfect freedom and also retain perfect alignment with the pivot edges at all times and without movement of the lever system.

The main suspension links are of cast steel, also the crossbars and rockers.

The bearings are provided with adjustable wedges designed with a vertical range of one-half inch, so as to provide for variations in the main girder construction.

The longitudinal checking is arranged with a substantial and rigid connection to the main box girders. The check rods are 1½ inches diameter and are provided with a turnbuckle connection for adjustment.

The transverse check rods are connected to transverse diaphragms between the main box girders and to the side walls of the pit. The check rods are 1¼ inches in diameter and four sets are used at each side of the main girders.

The dead rail is supported by transverse girders.

The weighing beam is graduated 300,000 pounds by 20 pounds, and a bottle weight of 100,000 pounds' capacity is used for loads over 300,000 pounds.

In order to maintain a maximum of stiffness and rigidity throughout the lever system and to eliminate the bad effects of deflection to as great an extent as possible, a load of 100 tons per section has been assumed in designing the scale mechanism. The maximum stress allowed in the members under this loading are as follows:

	Pounds per square inch.
Cast steel in tension	6,000
Cast iron in tension	2,000
Structural steel in tension	8,000

These scales are designed for weighing in motion some specially heavy coal cars which have recently been designed by the Norfolk & Western Railroad.

DISCUSSION.

Mr. RICHARDSON. I want to know what, in your opinion, is the most suitable type of railroad track scale?

I would also like to ask a second question: Can a car be weighed as accurately when moving across the platform as when at rest upon the platform?

Mr. BOUSFIELD. I do not think I care to answer the first question as representing the manufacturer. I do not think it is quite right.

As far as the second question goes, I do think quite as accurate results can be obtained by weighing cars in motion as by the ordinary method.

Mr. WULFSON. Mr. President, I want to ask the gentleman one question. You mentioned that to ascertain the accuracy of some scales you have to have a load of 8,000 pounds. Suppose an inspector has only 1,000 pounds of weights; how is he going to test the accuracy of an 8,000-pound scale?

Mr. BOUSFIELD. You will notice that when I spoke of the 8,000 pounds of test weights I was speaking of 2,000-bushel hopper scales which are always installed at large terminal elevators. I think you will find in such cases that the elevator company always has a good supply of test weights. At each corner you put 2,000 pounds, so you have 8,000 pounds of test weights; then you run your grain in up to

the full capacity, which is 120,000 pounds—60 tons; then, with the grain in, take your weights up successively from each corner and check with your beam for each 2,000 pounds taken off. It is about as rigid a test as can be made, and has always been found to give very accurate results.

Mr. WULFSON. You ought to inspect first the elevator company's test weights to see if they are correct. Is not that right? Are they tested by the National Bureau of Standards?

Mr. BOUSFIELD. They are furnished by some scale manufacturer and are supposed to be correct. Of course, if you wish to carry the test to finality you will have to test them with some standard such as that of the Bureau of Standards, if you wish to go to that extent.

Mr. WULFSON. Are the weights of these scale companies approved by the National Bureau of Standards before they are given out for commercial use?

Mr. BOUSFIELD. All test weights that are furnished are referred to a standard which has been approved by the Bureau of Standards. The master weights are approved by the Bureau of Standards, and the commercial weights are sealed by those standards. The individual weights that are furnished to the customer are not inspected by the bureau.

Mr. WULFSON. Thank you.

The CHAIRMAN. Mr. Wulfson, if you should desire as a city sealer to check up those weights, they are divisible into smaller quantities, even the elevator weights; so that you with your thousand pounds, or whatever you happen to have, could check those in case you doubted it. Your test weights should go back originally to the Government standard weights, and we know that the test-weight makers' standards do, and in that way you can check one upon the other.

Mr. WULFSON. Mr. President, I asked that question while the bill in the State of Indiana was pending, and the only one that fought the bill was the grain elevator company. We have to work in conjunction with the grain elevator company because they have a thousand-pound scale in the State of Indiana and the farmer has to rely upon it. Why didn't they work for the bill? Because they were afraid. That is the reason I asked you; because we have to work in conjunction with the elevator company, and I would not take their weights unless the Bureau of Standards approved them.

Mr. MARONEY. Mr. President, I would like to ask the gentleman a question. Does it make any difference in the weighing of a car, whether the air is on that car or not? In other words, will the air on the car, with the brakes set, make a difference?

Mr. BOUSFIELD. Yes, it will.

Mr. MARONEY. Will you explain why, please? I have had some experience in that, and I would like to know the reason.

Mr. BOUSFIELD. I do not know that I can give a very good scientific reason.

The CHAIRMAN. Mr. Maroney, suppose you explain your question a little more; tell these gentlemen what you mean by the "air on the car."

Mr. MARONEY. Why, in weighing a train of cars—we will assume, for instance, that it is a train of coal—the car goes on the platform of the scales and the air is on the brakes.

The CHAIRMAN. That is right—the air brakes. That is the point I wanted to bring out.

Mr. BOUSFIELD. For instance, if you are running a car over a track scale and the brakes are applied, a reaction takes place between the wheels and the rail, and that reaction, of course, has to be absorbed somewhere. The assumption would be that it would drive the scale over against the longitudinal checks or against the ends of the rails and produce friction and thus cause an inaccuracy in your weights.

Mr. MARONEY. The reason I asked the question is that I have had a difference of as much as 200 pounds on a car with the air on and with the air off. It is a truss scale. We found that it made a difference of as much as 200 pounds. Of course some cars varied more than others.

Mr. BOUSFIELD. How did you get the air on the car?

Mr. MARONEY. From the engine; they were all coupled together; of course they had to be.

Mr. FOSS. How did you know, then, that it was the air?

Mr. MARONEY. The car stayed in the same spot with the air on and with the air off, on a signal from the engineer.

Mr. FOSS. While the car was moving?

Mr. MARONEY. No; it was stationary originally; the car was on the platform of the scale and weighed with the air off.

Mr. FOSS. And all coupled together?

Mr. MARONEY. Coupled together.

Mr. FOSS. It does not make any difference. If your car is standing still it makes no difference whether your air is on or off.

Mr. MARONEY. But it has made a difference, and the gentleman who made the scale admitted that such was the case.

Mr. BRIGGS. Let me suggest this possibility: Suppose the car is on the scale with the brakes on; let us assume that there is a slight grade there, and that the weight and thrust of the car tending to make it roll down grade is carried on the brakes. Now suppose you release your brakes; it is possible for that car to ride down against the coupler and part of the weight be carried by the coupler of the next car.

Mr. MARONEY. Sure.

Mr. HAPGOOD. Mr. President, I think possibly a part of that error might be due to the air tube. There is great flexibility in the tube, but if you put a heavy pressure on the air the tube has a tendency to become very rigid. I had such an experience as that, in a smaller way, in a scale I designed at one time for weighing gas; there was an air tube in there, and when the pressure was on that tube the scale would show one indication and when the pressure was let off it would show another. It was due in that case entirely to the difference in the flexibility of the tube. Now, that might have some bearing on this error that Mr. Maroney speaks of, irrespective of what might come from the coupler.

The CHAIRMAN. It is extremely unlikely, I think, that any appreciable error would come from the flexibility of the tube; it would be very small.

Mr. BRIGGS. A further suggestion would be whether any source of this trouble could come from the checks on the scale not being in a horizontal line when the brakes were on. Say there might be considerable compressive force between the engine and the car; that is, the engine might put a horizontal thrust through the coupler and through the rigid brake of the car on the platform, and if the checks were not horizontal a corresponding error would be produced. It would disappear as soon as the brakes were released—as soon as the horizontal thrust was taken from the scale.

Mr. MARONEY. Mr. President, the gentleman has taken my ammunition. For the benefit of the other gentleman who talked about locking, etc., I would say that the car was wedged; there were wedges put under the wheels, and the car was weighed with the air on and off. The capacity of the scale itself was pretty well taken up, and the check rods were the solution of the trouble.

NOTES ON SCALES.

By C. A. BRIGGS, *Assistant Physicist, Bureau of Standards.*

Practically all attention, thought, and work given to weights and measures questions are for the ultimate purpose of realizing correct weights and measures.

The questions which arise can be roughly classified under two heads, questions of administration and questions of weighing instruments and weighing practices.

Questions of administration may be subdivided into those which deal with frauds and dishonest practices and those which deal with measures devised to test the accuracy of instruments and correct the errors which occur on account of wear and tear of the appliances and to mistakes and carelessness.

Aside from the questions which arise from consideration of dishonest practices the questions of administration are based almost entirely on consideration of the subjects which are grouped under the second head, namely, questions of weighing instruments and weighing practices.

In order that the ideal in weights and measures be approached, it is necessary that the questions of mechanisms and practices be satisfactorily disposed of.

These latter questions are the technical side of the subject and are the ones which are considered in this presentation.

A great many persons have the impression that these questions are entirely secondary in character and that in this respect conditions are entirely satisfactory. In regard to this I desire to state that this is decidedly not the case; a great many important problems await solution and a great deal remains to be accomplished. For illustration the elementary proposition of testing scales of fairly large capacity, such as wagon scales, is one of immediate importance. Scales are now generally tested at but a fraction of their full capacity, with

the result that a great many scales are being used continually for weighing large loads which are not giving correct weights.

The gratifying feature of the situation, however, is that the importance of technical questions is becoming recognized and steps are being taken which will ultimately reduce the various practices to satisfactory working bases.

In large scales a great number of engineering questions relating to the design, installation, test, and maintenance have to be reduced to principles of general application. In this connection it is well to recall that in designing bridges, buildings, machines, engines, etc., certain engineering principles of general application have been recognized and constantly applied for years, but it is only recently that there has been any consistent attempt to apply them to the construction of scales.

For this reason the technical literature on scales is not very extensive and the present paper is intended to initiate discussion on various items pertinent to the subject.

Owing to the great number of different subjects presented there is an entire lack of unity in the paper as a whole, but in this manner more ground can be covered in the hope that the general interest in the subject will be stimulated.

The paper is divided into two parts: I. Experiments on scales and weighing; II. Technical features of scale construction.

I. EXPERIMENTS ON SCALES AND WEIGHING.

During the past year a large number of minor investigations in the way of experiments and tests have been made at the Bureau of Standards. While some of the results are very interesting, they are not sufficiently numerous to establish them as representative. For this reason most of the results obtained will be given at a future date when they can be supplemented with additional information.

Upon account of its bearing upon an article by the writer which appeared in the report of the conference of a year ago, the results of a test on the load distribution of a wagon scale will be given.

The experiment was made upon a wagon scale belonging to the Bureau of Standards and was for the purpose of determining which type of load distribution I, II, or III prevailed. (See article in seventh conference report.)

It may at first seem difficult to make such an experiment, as a method of determining the weight carried on any particular corner is not at once obvious. In the experiment a method was secured which is not only useful in the present case but may be modified to meet other questions of a similar nature.

The method applied was as follows: Referring to figure 1, which appeared in last year's article, a jack was placed under one of the corners—in the first instance it was placed so as to support one end of the short lever where it normally was supported on the long lever. When this was done the scale had to be rebalanced, as the dead weight of the platform carried on the corner in question was now supported by the jack and did not reach the beam.

A certain amount of known test weights were then placed on the platform of the scale. The portion of these added test weights which was carried on the corner corresponding to the jacked lever would not appear on the beam. For instance, if 600 pounds of weights were added and the beam read 525 pounds, then the missing 75 pounds would be carried on the jacked corner.

In this way the load distribution was explored in reference to the corner under which the jack was placed and mapped out on the platform.

In the previous article on load distribution which appeared last year the results were expressed by designating the lines of constant weight with respect to any particular corner considered. In the present experiment the values were obtained in a manner which gave these curves directly.

The weights were placed in a row on the platform and then changed by moving the row along until a balance of some particular value was

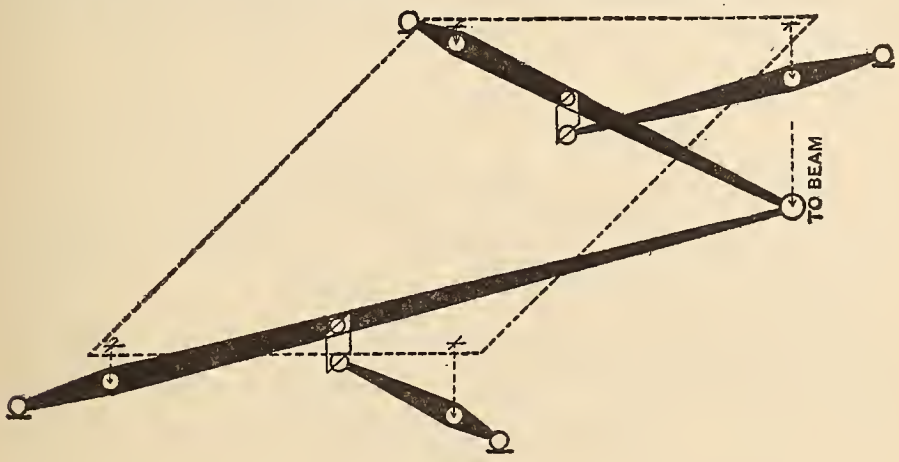


Fig. 1.

obtained. When the weights were in this position the location of the center of gravity of the weights was marked on the platform and subsequently measured. For instance, during one series of observations the poise was set, after balancing at zero load, at 235 pounds; 500 pounds of test weights were then placed in a position to balance this and the position of their center of gravity was marked. They were then lined up along a new row and moved along until a balance was again secured, and the position of their center of gravity was marked for this position, etc.

This was repeated until a sufficient number of marked points were obtained to locate the line of constant weight for that particular load. In this case the load was 500 pounds, the amount appearing on the beam from the three unjacked corners was 235 pounds, so that the line determined was the line of constant weight for 500 − 235 pounds or 265 pounds.

The work of determining the points proceeded very rapidly.

The weights were placed in rows and then the rows were shifted lengthwise by taking a weight from one end and placing it on the

other end. For intermediate positions of the weights the end weight was placed on top of the other weights as determined by trial and the position of the center of gravity could be very rapidly estimated within a fraction of an inch. Knowing approximately the position of the point desired the different trial operations could be carried out in very rapid order.

The results of the test are given in figure 2. The points correspond to actual observations and the curves are drawn in to correspond. The slight irregularity of the points was caused by varying wind pressure. Considering the character of the experiment, these points are surprisingly regular.

The results of this test were unexpected; the action of the platform came under that described under class III in the article referred to in the report of the conference of last year. The platform was almost perfectly flexible. This was not looked for, as the platform had a steel frame and was very strongly built. While some flexibility was

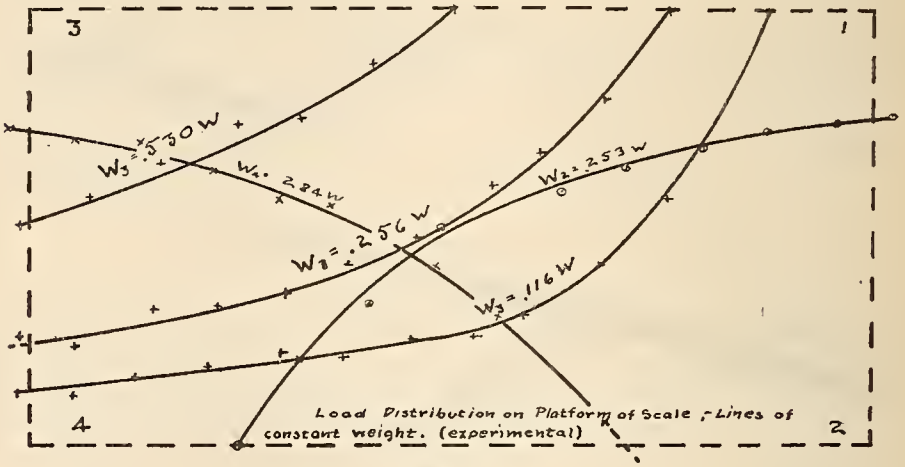


Fig. 2.

expected, it was not thought that the absence of rigidity would be as pronounced as is indicated in the curves.

During the test several precautions were observed. For instance, with the jack standing upon the solid concrete floor of the pit, it is to be expected that the lever supported on the jack would be held more rigidly than when attached to the somewhat flexible lever system. That this was not sufficient to alter the results was demonstrated by placing a cushion of rubber between the end of the lever and the jack, allowing considerable yield, and the result of the load distribution was unaltered.

It is desired to direct particular attention to the fact that this method of exploring for the load distribution can be applied to railroad track scales.

The bridges of most track scales are of the continuous-girder construction. The bridge is supported upon the levers which form a somewhat interlocked and flexible system, making the question of the load distribution a rather complex problem. By jacking up

various pairs of main levers, balancing the beam, then weighing a known test car on various points of the scale the load distribution can be experimentally determined, as the portion of weight which does not appear on the beam will be that carried on these pairs of levers.

The experimental measurements on the deflection and torque of the levers of track scales will be mentioned in the description of the instruments used, which appears in a later portion of this paper.

Trussed levers.—The design of trussed levers does not seem to have been reduced to universally accepted rules, as a great many of them are designed by cut and try methods. In this connection the statement has been made that the compression member in trussed levers should be designed as a simple strut, one end fixed, the other end hinged or rounded.

A recent experiment made at the Bureau indicates that this rule does not allow for the facts in all cases. It was found during the test that the compression member tested carried a transverse load corresponding to over 20 per cent of the total load on the end of the lever.

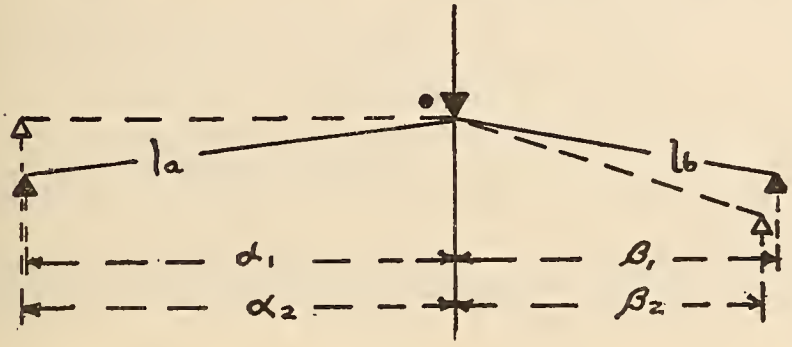


Fig. 3.

II. TECHNICAL FEATURES OF SCALE CONSTRUCTION.

1. THE PRACTICE OF INTRODUCING "RANGE" IN LEVERS AND ITS RÔLE IN THE OPERATION OF THE SCALE.

It is impossible to maintain the knife-edges of a scale in a straight line. First, the effect of the load causes the lever to bend and throws the knife-edges out of line if they were in line at zero load; secondly, we have changes that proceed with use, such as wear of the knife-edges, which alter their original alignment.

Let us consider in detail the effect produced on the multiplication by the slight "bell-crank" lever effect produced by having the knife-edges out of line. Referring to figure 3, which is exaggerated in order to bring out the effects, two positions of a lever are given. The first position is indicated by a heavy line and the second is indicated by a dotted line.

In the first position the multiplication is not $\frac{l_a}{l_b}$ but $\frac{\alpha_1}{\beta_1}$, which is the ratio of the projections of l_a and l_b on a line perpendicular to the lines of action of the forces acting at the ends of the beam.

Now let the lever be deflected to the second position, the projections of l_a and l_b are not the same as before but are now α_2 and β_2 and the multiplication has changed from $\frac{\alpha_1}{\beta_1}$ to $\frac{\alpha_2}{\beta_2}$.

From this we can see that the multiplication changes with the position of the lever.

If the above was part of the lever train of a scale the multiplication of the scale would change with the load. In other words, the scale

Fig. 4.

might balance correctly at a zero load and weigh 1,000 pounds correctly but the second thousand pounds might add but 990 pounds to the amount shown on the beam.

In contrast to this, if the knife-edges are in a straight line and remain in a straight line the tilting of the lever will not alter the ratio of $\frac{\alpha}{\beta}$, and the multiplication would remain constant. The figure corresponding to this is figure 7 and will be discussed later.

Needless to say, this constancy in the multiplication is the thing desired, and in an attempt to secure it the practice of "ranging" has been developed.

"Ranging" is generally understood to mean the throwing of the middle knife-edge past the line determined by the two outside knife-edges, as indicated in figure 4.

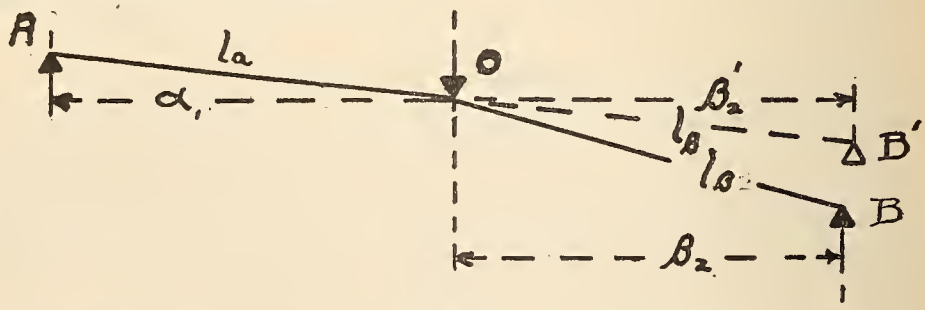


Fig. 5.

I will now take up in detail the effect of this ranging on the action of the scale.

Levers in large scales are usually adjusted for level, etc., at a time when no load is present on the scale. Now let us assume that there is no range present in the levers of a scale and that an even arm lever is taken to simplify matters.

At the start $l_a = \alpha = l_\beta = \beta$, the distance between knife-edges is a horizontal line, and the multiplying power $\frac{\alpha}{\beta}$ is unity (not shown in figure).

When the scale is fully loaded, in general the lever will be tilted to some extent. Suppose first this tilting takes place without the knife-edges being thrown out of line, as shown in figure 5, by A O B′. The multiplication is equal to $\frac{\alpha_1}{\beta'_2}$, which ratio can be seen from the similarity of triangles produced to be equal to $\frac{l_a}{l_\beta}$, or in other words the multiplication would be unchanged.

Fig. 6.

Now as a matter of fact the lever will bend under the effect of the load and after being loaded will be represented by A O B, the multiplication in this case being $\frac{\alpha_1}{\beta_2}$. As β'_2 is smaller than β_2 the multiplication will be changed.

Let us now consider the case where the proper amount of range is given to the knife-edges. The position of the lever at zero load or small loads is represented by figure 6. (The range is very much exaggerated to bring out the points.)

The multiplication is $\frac{\alpha}{\beta}$ and if the lever is properly leveled, since $l_\alpha = l_\beta$ the multiplication will be unity.

Now let the load be applied so that the effect of bending is indicated by figure 7.

Fig. 7.

The bending will bring the knife-edges into a straight line, the geometrical result being that the multiplication $\frac{\alpha_2}{\beta_2} = \frac{l_a}{l_\beta} =$ unity as before.

In this way the accuracy of the scale has been preserved.

As a scale remains in service the foundations and fastenings tend to loosen, causing greater tilts to be given to the lever. The knife-edges wear down, etc., and tend to reduce the range originally provided. For this reason it is necessary to provide a range that is in excess of that called for by a consideration of the bending of the lever alone.

2. CHANGE IN THE EFFECTIVE RANGE OF A LEVER PRODUCED BY THE WEAR OF THE KNIFE-EDGES.

(a) *Flat bearings.*—If we take into consideration the bending of the levers under load and the wear of the knife-edges produced by use, and establish a range according to this, we will find that it is much less than the range usually employed in practice.

Let figure 8 represent the knife-edges in a lever in which wear has occurred.

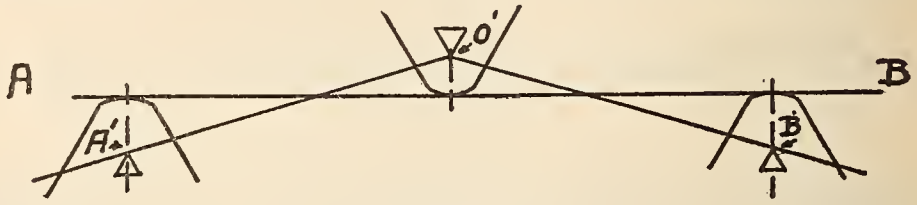


Fig. 8.

If we were to determine the range by a mechanical means it would be zero, as a straight line, such as is indicated by the line A B, would touch the tip of all three knife-edges.

However, owing to the rounding of the knife-edges the real effective range is represented by the line A′, O′, B′; that is, as far as the effective multiplication of the lever is concerned, the blunt knife-edges could be replaced by sharp knife-edges at the points indicated.

Looking at it from another viewpoint, we can see that the multiplication of the lever shown in figure 8 would be changed on tilting the lever by the knife-edges rolling on their planes. If A′, O′, and B′

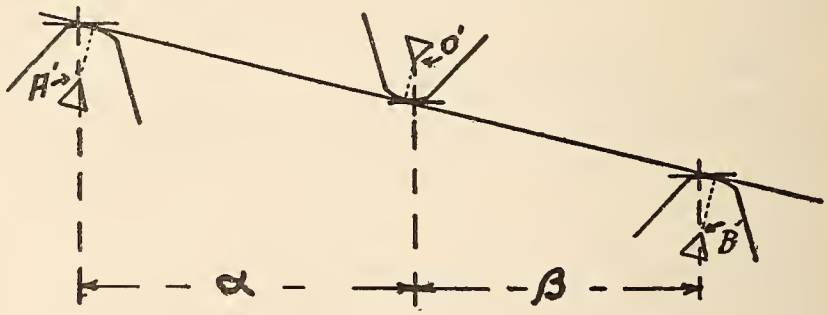


Fig. 9.

represent the centers of curvature of the rounded portion of the knife-edges which make contact with the bearing planes, we can see that if the lever is tilted the planes of the bearings remain parallel to the horizontal plane, so that the points of contact are always directly over the points A′ and B′ and directly under the point O′. This is illustrated by figure 9.

In other words, the projection of the distance between the points of contact on a horizontal line which establishes the multiplication ratio

is always the same as the projections of the distances A′ O′ and O′ B′ on that line.

Looking now at a knife-edge as represented in figure 10, we see that while the actual wear has been to change the knife-edge from the point O_1 to the point O_2 the effect has been the same as changing the sharp edge from the point O_1 to the point O_3. This explains the necessity for increasing the range over what might at first sight seem to be a reasonable amount.

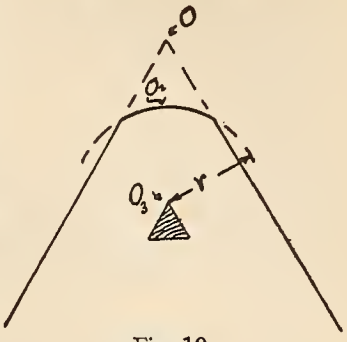


Fig. 10.

At this point the fact should be emphasized that where this effect of a rounded knife-edge is present, it is not eliminated or reduced by reducing the amplitude of the movement of the levers.

(b) *Rounded bearings.*—In order to make the discussion complete the case will be considered where the knife-edge bears in a looped or curved bearing.

In this case as any rounded knife-edge turns upon the bearing there will be a rolling action between the knife-edge and bearing and the point of contact will not remain immediately above or below the center of curvature of the rounded knife-edge as in the preceding discussion.

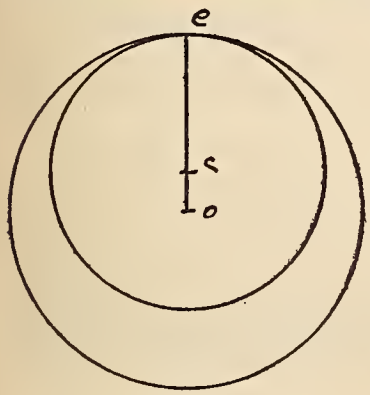


Fig. 11.

Let the condition before deflection be represented by figure 11. The inner circle represents the knife-edge as replaced by a cylinder which has the same radius of curvature as the flattened portion of the knife-edge.

The bearing surface of the loop is represented by the larger circle with the center at O.

As the lever deflects the inner circle will rotate and roll on the outer circle. The outer circle will retain its vertical alignment as the bearing loops are kept aligned by the forces it transfers from this lever to the next.

Let the deflection take place in a clockwise direction through an angle θ. The situation will then be represented by figure 12.

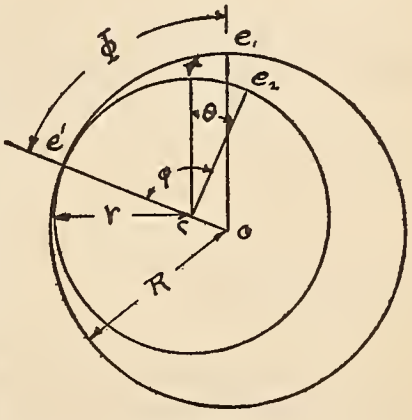


Fig. 12.

While the inner circle has rotated through an angle θ the point of contact has moved through an angle ϕ with respect to the inner circle and through an angle Φ with respect to the outer circle. The

outer circle as mentioned before, preserves its alignment and does not rotate.

If a flat bearing were used the point of contact would change from the point e_2 to the point f passing over the angle θ. In the rounded bearing as represented the point of contact under the same circumstances, passes through the angle ϕ which is much greater than the angle θ.

It is necessary to find the relation between the angle θ and the angle ϕ.

In order to do this we will suppose that the inner circle will roll through an angle such that the point of contact between the two circles passes through an angle 2π with respect to the outer circle.

Let R be the radius of the outer circle and r the radius of the inner circle.

During this rolling the distance passed over is $2\pi R$.

When the point of contact has moved completely about the inner circle it will have passed over a distance $2\pi r$.

The difference $2\pi R - 2\pi r$ represents the additional distance the point of contact will have moved about the smaller circle over and above a full turn. This corresponds to an angle with respect to the small circle of

$$\frac{2\pi R - 2\pi r}{r}$$

$$\frac{2\pi\ (R-r)}{r}$$

It is this angle which is effective in turning the inner circle with respect to the outer circle and corresponds to the angle θ

$$\Phi \propto \theta$$

$$\Phi = K\theta$$

when $$\Phi = 2\pi,\ \theta = \frac{2\pi\ (R-r)}{r}$$

from which $$K = \frac{r}{(R-r)}$$

So that we have $$\Phi = \frac{r}{R-r}\theta$$

It is now necessary to obtain ϕ in terms of θ, this will be done by first obtaining ϕ in terms of Φ.

$$\mathrm{I} \propto \phi$$

$$\Phi = c\phi$$

When

$$\Phi 2\pi \quad \phi = 2\pi + \frac{2\pi\,(R-r)}{r}$$

$$2\pi = 2\pi c\left(1 + \frac{R-r}{r}\right)$$

$$= 2\pi c\left(\frac{R}{r}\right)$$

$$c = \frac{r}{R}$$

$$\Phi = \frac{r}{R}\phi$$

Referring to equation above and substituting for Φ we have

$$\frac{r}{R}\phi = \frac{r}{R-r}\theta$$

$$\phi = \frac{R}{(R-r)}\theta$$

Owing to the limited amplitude of vibration of the levers the actual changes will take place over small angles so small that, angle ≡tan,≡ sin, etc., and the shift of the point of contact between knife-edge and bearing is in a sensibly straight line.

For this reason the effect of the round knife-edge acting on a round bearing can be expressed in terms of a round knife-edge of different radius acting on a flat bearing.

In the case of a round knife-edge on a flat bearing we have

$$P = \frac{S}{\theta}$$

where P is the radius of the bearing surface of the knife-edge, S is the distance the point of contact moves on the periphery of the rounded knife-edge while the lever deflects through the angle θ.

For a rounded knife-edge the change S is

$$S = \phi r$$

$$S = \frac{Rr}{(R-r)}\theta$$

$$\frac{S}{\theta} = P = \frac{Rr}{(R-r)}$$

$$P = \frac{Rr}{(R-r)}$$

The rounded knife-edge and rounded bearing could be replaced by a flat bearing after increasing the radius of curvature of the knife-edge from r to $\frac{Rr}{R-r}$

From this it can be seen that the effect of the rounded bearing loop is to aggravate the effect of rounded knife-edges.

Referring to the last expression it can be seen that the effect of the loop does not become of appreciable magnitude until the bearing is so flat that its radius of curvature approaches in magnitude that of the bearing loop.

3. METHOD OF COMPUTING THE MULTIPLYING POWER OF SCALES

While this is a comparatively simple proposition so much confusion has resulted from the different methods of procedure and the division of levers into classes, such as levers of the first class, second class, etc., that it seems worth while to point out the simple relations that exist and form the basis of figuring the multiplication.

Suppose that we take the wagon scale of the Bureau of Standards, which has the levers as indicated in figure 13.

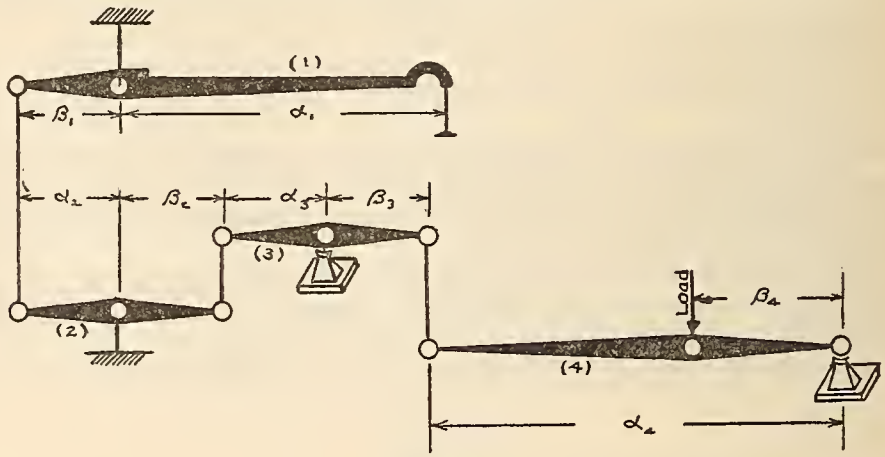


Fig. 13.

In a lever we have a fulcrum knife-edge and two others. These two others can be classified as the load knife-edge or the beam knife-edge, depending upon whether the connections to the knife-edge run toward the load or toward the beam. The fulcrum knife-edge is not necessarily one of the end knife-edges.

Referring to the figure, all of the distances between the fulcrum and the beam knife-edge are denoted by α, and the distances between the fulcrum and the load knife-edge are denoted by β. The subscripts to the α's and β's denote to which lever they refer.

Then the multiplication can be written

$$F = \frac{\alpha_1 \times \alpha_2 \times \alpha_3 \times \alpha_4}{\beta_1 \times \beta_2 \times \beta_3 \times \beta_4} \ldots \text{etc.}$$

In order to obtain the numerical value for m it is only necessary to substitute the numerical values corresponding to the α's and β's and carry out the computations indicated.

Frequently the ratios $\frac{\alpha_1}{\beta_1}, \frac{\alpha_2}{\beta_2}$, etc., are given, and the above formula best fits this when it is written

$$F=\left(\frac{\alpha_1}{\beta_1}\right)\times\left(\frac{\alpha_2}{\beta_2}\right)\times\left(\frac{\alpha_3}{\beta_3}\right)\times\left(\frac{\alpha_4}{\beta_4}\right)\ldots \text{etc.}$$

This method applies to all lever scales; it is of course necessary that the proper α and β appear for each lever in the train running from the beam counterpoise to the load.

Where an even arm lever appears the ratio $\frac{\alpha}{\beta}$ is unity and it may be dropped from consideration in the formula.

The preceding work has been carried out to determine the ratio between the load and the corresponding counterpoise hung on the end of the beam.

When the multiplication is to be determined in reference to a sliding poise it is necessary to substitute the stroke of the poise for the value corresponding to α_1.

This is indicated in figure 14.

Our formula then becomes, on substituting α'_1 for α_1

$$F=\left(\frac{\alpha'_1}{\beta_1}\right)\times\left(\frac{\alpha_2}{\beta_2}\right)\times\left(\frac{\alpha_3}{\beta_3}\right)\times\left(\frac{\alpha_4}{\beta_4}\right)\ldots \text{etc.}$$

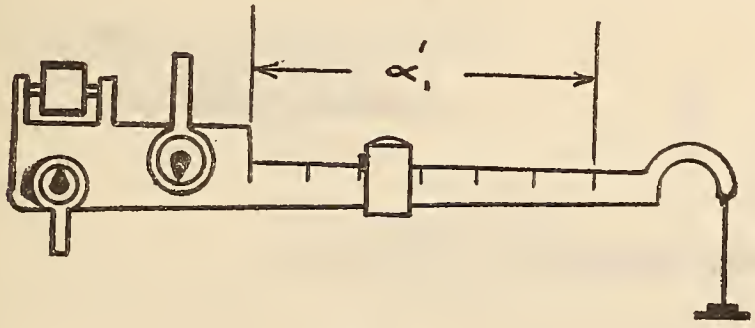


Fig. 14.

In some levers we have more than three knife-edges, or their equivalent contact points or buttons, such as in the "long-levers" of wagon scales and the middle-extension levers of railroad track scales. This, however, introduces no confusion, as in going from the beam to any point where the thrust of the load is directly received we are only concerned with three knife-edges in a beam at a time.

In the preceding the necessity of classifying the levers as first, second, or third class, as is sometimes done, is avoided, as basing all measurements upon the fulcrum knife-edge, the necessity of the classification disappears.

In order to make the matter of computating the multiplications clear, the following examples are given:

In the wagon scale of the Bureau of Standards the values are as follows:

Part		Inches	Part		Inches
α_1	=	35.0	β_1	=	1.75
α_2	=	35.3	β_2	=	12.7
α_3	=	28.5	β_3	=	28.5
α_4	=	144.0	β_4	=	6.0

$$F=\frac{35.\ \times 35.3\times 28.5\times 144.0}{17.5\times 12.7\times 28.5\times 6.0}=1333.$$

In Mr. Epright's scale of the Pennsylvania Railroad we have:

$$\frac{\alpha'_1}{\beta_1}=\frac{48}{3};\ \frac{\alpha_2}{\beta_2}=\frac{5}{1};\ \frac{\alpha_3}{\beta_3}=\frac{18}{5};\ \frac{\alpha_4}{\beta_4}=\frac{1}{1};\ \frac{\alpha_5}{\beta_5}=\frac{25}{3};\ \frac{\alpha_6}{\beta_6}=\frac{5}{1}\text{ and }F=12{,}000$$

For field work where it is desired to measure levers for computing multiplication a steel tape divided metrically in millimeters will save time and reduce mistakes.

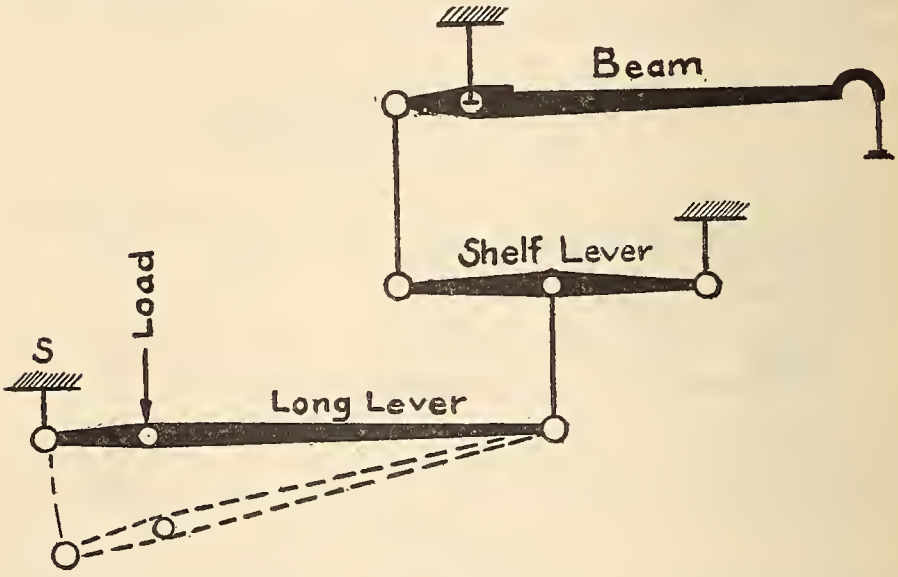


Fig. 15.

4. POSSIBLE EFFECTS OF SERVICE UPON THE MULTIPLYING POWER OF SCALES.

The following note was prepared to call attention to the fact that a scale in use may become either "fast" or "slow" depending upon the character of the supports.

It seems desirable to introduce this subject, as frequently scale men seem to think that the effect should occur consistently one way or the other.

Let us consider the lever train of a wagon scale as diagramatically set forth in figure 15.

Suppose first that the change in the multiplication is produced by the tilting of the long lever and that under load a weak support at *S* causes the lever to take the position indicated by the dotted line in figure 15 and the scale becomes slow.

Next suppose that the support at *S* is comparatively rigid and that the springing and yielding takes place largely in the supports and connections of the beam and shelf levers. When a load is applied in this case the position assumed by the long levers will be as indicated in figure 16.

In this case the scale will become fast as the load increases.

From this we see that with the same levers the error can be fast or slow, depending upon the character of the supports.

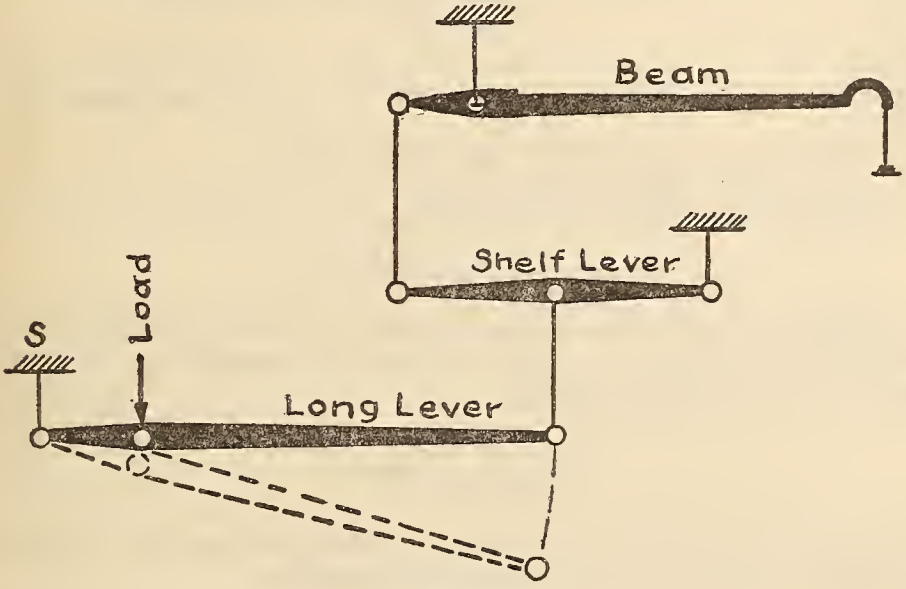


Fig. 16.

In order to make the point clear the illustration has been confined to one lever, but in actual conditions the situation is further complicated by the action of the other levers of the train. It is possible to consider the action of each lever in connection with all the rest, but that will not be attempted in the present article.

I will just note in passing that it is theoretically possible to adjust elasticity of the supports so that all the levers will remain horizontal under all loads, preserving a precise value of the multiplication, but the application of this is probably remote.

5. THE DEFLECTION OF BEAMS OF VARYING CROSS SECTION.

This subject is of particular interest in connection with scales, the levers of which consist essentially of cantilever beams having concentrated loads.

Such levers are outside the ordinary practice relating to members under transverse stress in two respects: First, cast iron and in some

cases cast-steel is used in their construction; secondly, the cross-section of a given lever varies from point to point throughout its length.

It is this second item which prompts this article. The common problems of engineering involve only beams of constant cross section, the deflections of which are easily derived and expressed in formulas. In the levers of scales in general this is not true, and at the same time a knowledge of the deflections present is of more importance than in anything else, as deflections change the lever ratios and thereby alter the multiplication upon which the accuracy of the scale depends.

Starting with the equation which forms the basis for the common theory of beams we have—

$$\frac{d^2y}{dx^2}=\frac{M}{EI} \tag{1}$$

where

x = distance of the point considered from some fixed point on the beam.

y = deflection of the neutral axis at the point x.

M = external moment at the point x.

I = moment of inertia of cross section at the point x.

E = Young's modulus.

Ordinarily E and I are both constant, but in the present case I is variable and has to be retained under the integral sign, so that we have for the expression for y,

$$y=\frac{1}{E}\int\int\frac{M}{I}dx\cdot dx \tag{2}$$

If we choose the end of the beam at which the load P is applied as the origin of x we have for the external moment

$$M=Px \tag{3}$$

As P is constant we may remove it from an integral sign and (2) becomes

$$y=\frac{P}{E}\int\int\frac{x}{I}\cdot dx\cdot dx \tag{4}$$

The expression under the integral sign depends only upon the geometry of the beam. As the integration is carried out the proper constants of integration must be added.

The cross sections of some levers used in scales vary in such a manner that the value of I can be expressed as an algebraic function of x, but in general the resulting analytical expressions are difficult to handle. In other cases the cross section varies in an arbitrary manner so that a graphical method for solving for the deflection will be given.

The method will be illustrated by working out the deflection for the long arm of a fifth lever of a 300,000-pound capacity track scale.

The method consists in substituting graphical methods in place of mathematical processes. The value to be obtained is the value of $\int\int \frac{x}{I} dx.\ dx$ together with the proper constants of integration. When this is done it is a comparatively simple matter to obtain the numerical value of y—the deflection at any point—by multiplying by P and dividing by E.

The procedure can be followed with the assistance of figure 17 and table of values, page 153.

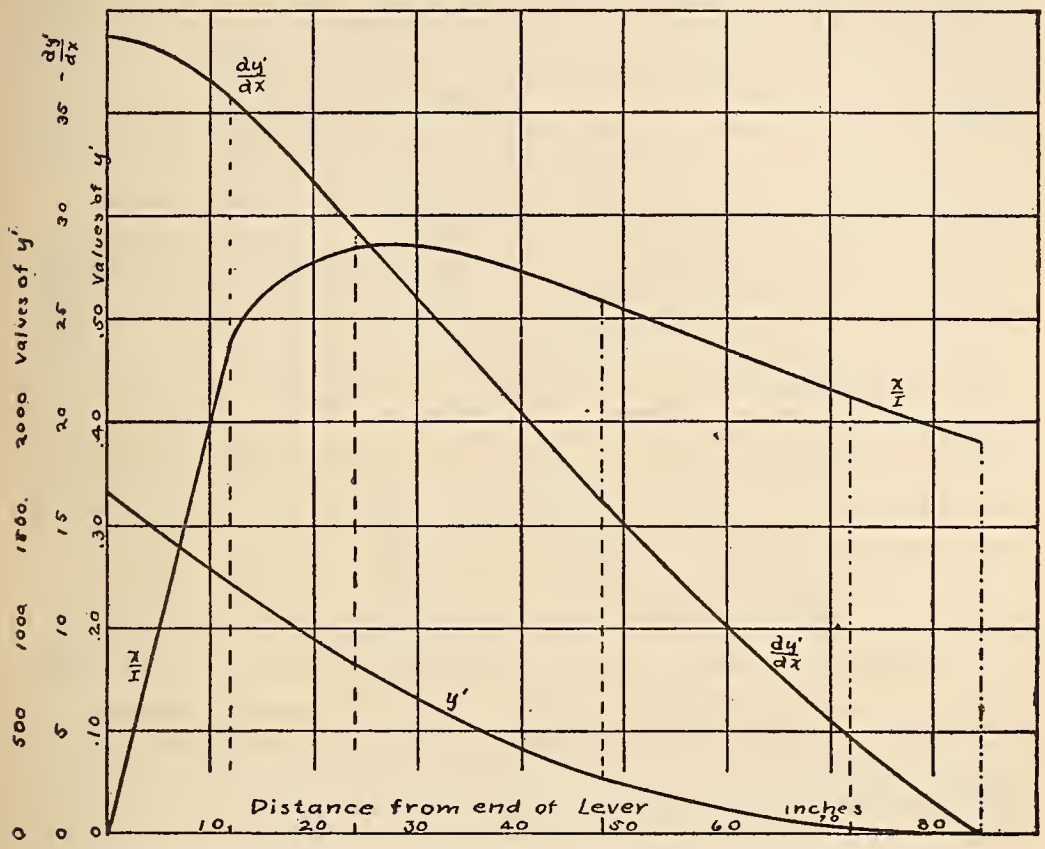


Fig. 17.

First the values of I corresponding to certain values of X are computed and placed in the table as indicated in column 1. The value of $\frac{x}{I}$ is then computed and placed in the column as indicated. From these values the curve indicated by $\frac{x}{I}$ in the figure is plotted and the first integration is made.

This integration is made by the primitive method of counting the squares and determining the relative area under various portions of the curve. It was not practical to reproduce in the cut the small squares actually used in counting the area. The values obtained in

this manner appear in the column marked 4. It is necessary to multiply these values with a factor which will reduce them to areas corresponding to the coordinates of the curve; i. e., the squares which are counted on the plot represent arbitrary values depending upon the scale to which the curves are plotted.

When these values are multiplied by the proper factor the values given in the column marked $\Delta\int\frac{x}{I}dx$ are obtained. It is necessary to understand what these values mean; for illustration, the value 13.2 which is opposite the value $x=48$ represents the area under the curve between the points $x=24$ and $x=48$. The integral of the curve from the point 0 to the point 48 corresponds to the area under the curve from $x=0$ to $x=48$, or is the sum of all the $\Delta\int\frac{x}{I}dx$'s up to that point. When this summation is made for all the points we get the values tabulated in the column headed $\int\frac{x}{I}dx$.

The constant of integration must now be added. When this is done the values will correspond to the slope of the elastic line at the various points. In this discussion $x=0$ at the end of the beam and the beam or lever is assumed to be rigidly held in a horizontal position at its thickest portion. In other words, the slope of the elastic line is zero when $x=84.52$, the length of the beam. The constant of integration is therefore -38.68, which when added to the column marked $\int\frac{x}{I}dx$ gives the column headed $\frac{dy'}{dx}$ (the negative sign is not carried in the column).

The values of $\frac{dy'}{dx}$ so obtained are plotted against the corresponding values of x giving the curve marked $\frac{dy'}{dx}$ in the figure. This is integrated as in the first instance by counting the squares, the results appearing in column marked 8, which when multiplied by the proper factor depending upon the scale to which the curve is plotted gives the values in the column marked $\Delta y'$. These are then added as before, giving the values headed $\Sigma\Delta y'$. It now remains to add the final constant of integration. The deflection of the elastic curve is assumed to be zero at the point $x=84.52$, so that the constant of integration is 1,662. When this is added with the proper sign the values given in the column marked $y\frac{E}{P}$ are obtained and plotted in the figure as indicated by the curve marked y'.

This last curve represents the value of $\int\int\frac{x}{I}\,dx\,dx$ for various values of x. When these values are multiplied by the load P at the end of the lever and divided by the value of Young's Modulus the deflection corresponding to the point will be given.

On the particular scale to which the lever considered belongs the force P is 2000 pounds when the scale is loaded to its capacity (300 000 pounds). The material of the lever is cast iron, for which

a value of $E=15{,}000{,}000$ may be assumed. Under this condition the deflection in inches will be

$$\frac{1662\times 2000}{15{,}000{,}000}=0.22 \text{ inches.}$$

In the curve of $\frac{x}{I}$ the portion between $x=0$ and $x=12$ is arbitrarily drawn straight. This partially allows for the fact here, as in other levers, that the end section is thickened to allow the knife edges, nose irons, etc., to be attached and to withstand the shearing forces that are present.

A great deal remains to be accomplished before the scale levers can be designed with a minimum loss of time and with a maximum knowledge of their properties, but the subject seems to be on the way toward a rapid development and adjustment.

With the assistance of a few charts and the development of suitable empirical integration formula, it will be possible to avoid a great amount of detail in designing levers and scale parts and at the same time a full knowledge of their properties will be known.

Tables of values—Graphical solution of deflection.

x	I	$\frac{x}{I}$	(4)	$\Delta\int\frac{x}{I}dx$	$\int\frac{x}{I}dx$
0	.....	0.000	.....	0.00	0.00
12	25.2	.476	.....	2.85	2.86
24	42.3	.567	159.9	6.38	9.24
48	93.0	.516	329.9	13.20	22.44
72	170.2	.423	283.8	11.35	33.79
84.52	222.3	.380	122.2	4.89	38.68

x	$\frac{dy'}{dx}$	(8)	$\Delta y'$	$\Sigma\Delta y'$	$y\frac{E}{P}=y'$
0	38.68	000.0	0.0	00.0	1662.0
12	35.82	224.2	448.0	448.0	1214.0
24	29.44	197.4	395.0	843.0	819.0
48	16.24	271.9	544.0	1387.0	275.0
72	4.89	123.2	246.0	1633.0	29.0
84.52	0.00	14.4	29.0	1662.0	00.0

6. CHANGES PRODUCED IN THE EFFECTIVE LENGTHS OF LEVERS BY FLEXURE.

In the following certain approximations are made which are essentially those involved in the common theory of beams, namely, the approximations which obtain when $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ are small compared to unity.

In a lever or beam under flexure the fiber stress is zero along the neutral axis, and the shearing forces have no tendency to lengthen or shorten it. Therefore we can consider the length S of the elastic curve to be constant, but its projection on its original line becomes shorter as the deflection increases.

In dealing with the deflections of levers the sections of which vary in an arbitrary manner from point to point graphical means were used to obtain the slope and form of the elastic curve. As the present problem is a continuation of this, the same ideas will be employed.

Let the elastic line be represented by the curve, figure 18. Erect ordinates for the various increments chosen for x. If the increments are chosen reasonably small, we may regard the curve as straight in the intercepted portions without sensible error.

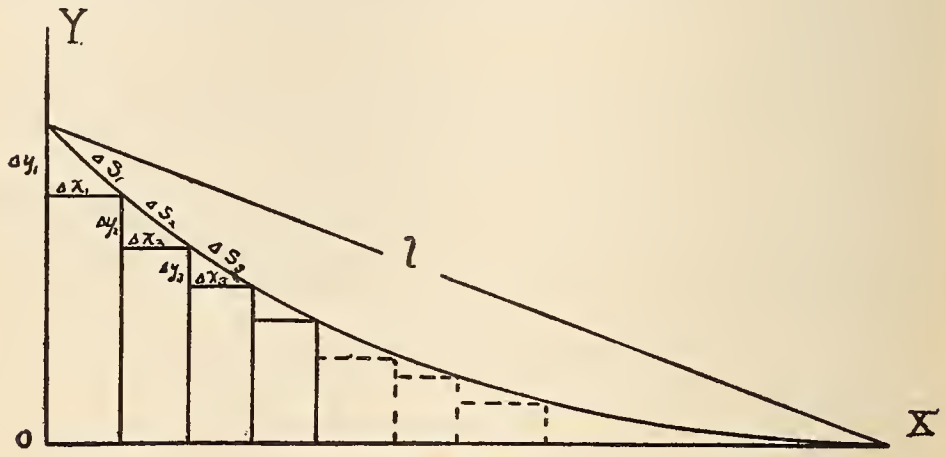


Fig. 18.

The length of the curve then becomes,

$$S = \Delta S_1 + \Delta S_2 + \Delta S_3 + \tag{1}$$

In general we have from the triangles formed,

$$\Delta S = \sqrt{(\Delta x)^2 + (\Delta y)^2} \tag{2}$$

$$\Delta S = \Delta x \sqrt{1 + \left(\frac{\Delta y}{\Delta x}\right)^2} \tag{3}$$

As $\left(\frac{\Delta y}{\Delta x}\right)^2$ is very small, this can be expanded, taking the form,

$$\Delta S = \Delta x \left[1 + \frac{1}{2}\left(\frac{\Delta y}{\Delta x}\right)^2\right] \tag{4}$$

The height of any of the Y ordinates and the corresponding values for the increments Δy vary directly as the load P applied, and inversely as the value of Young's modulus, E.

Let the values of

$$\Delta y_1, \Delta y_2, \Delta y_3, \ldots \text{ etc., be } \frac{P}{E}K_1, \frac{P}{E}K_2, \frac{P}{E}K_3, \ldots \text{ etc.,}$$

where the K's are numerical constants obtained from the geometry of the beam.

Then from (4)

$$\Delta S = \Delta x \left[1 + \frac{1}{2}\left(\frac{P}{E}\frac{K}{\Delta x}\right)^2\right] \tag{5}$$

$$= \Delta x + \frac{1}{2}\left(\frac{P}{E}K\right)^2 \frac{1}{\Delta x} \tag{6}$$

and

$$S = \Sigma \Delta S \tag{7}$$

$$= \Delta x_1 + \Delta x_2 + \Delta x_3 + \cdots + \frac{1}{2}\frac{P^2}{E^2}\frac{K_1^2}{\Delta x_1} + \frac{1}{2}\frac{P^2}{E^2}\frac{K_2^2}{\Delta x_2} + \cdots \tag{8}$$

$$= \Sigma \Delta x + \frac{1}{2}\frac{P^2}{E^2}\Sigma\frac{K^2}{\Delta x} \tag{9}$$

This $\Sigma \Delta x$ is the projection of the elastic curve upon the X-axis; calling this X, we have

$$X = S - \frac{1}{2}\frac{P^2}{E^2}\sum\frac{K^2}{\Delta x} \tag{10}$$

The distance between the end and outer knife edges as represented by l in figure 18 can be expressed

$$l = \sqrt{X^2 + (y_0')^2} \tag{11}$$

y_0' is the value of y obtained for the point $x = 0$ in the elastic curve expression

$$y_0' = \Delta y_1 + \Delta y_2 + \Delta y_3 + \cdots \tag{12}$$

$$y_0' = \frac{P}{E}(K_1 + K_2 + K_3 + \cdots) \tag{13}$$

$$= \frac{P}{E}\Sigma K \tag{14}$$

As long as the quantity $\frac{1}{2}\frac{P^2}{E^2}\sum\frac{\kappa^2}{\Delta x}$ is so small that its squares may be neglected, squaring equation (10) gives

$$X^2 = S^2 - S\frac{P^2}{E^2}\sum\frac{\kappa^2}{\Delta x} \tag{15}$$

$$(y_0')^2 = \frac{P^2}{E^2}(\Sigma\kappa)^2 \tag{16}$$

so that

$$l = \sqrt{S^2 - S\frac{P^2}{E^2}\sum\frac{\kappa^2}{\Delta x} + \frac{P^2}{E^2}(\Sigma\kappa)^2} \tag{17}$$

$$l = \sqrt{S^2 - \frac{P^2}{E^2}\left[S\Sigma\frac{\kappa^2}{\Delta x} - (\Sigma\kappa)^2\right]} \tag{18}$$

$$l = S\sqrt{1 - \frac{P^2}{E^2}\left[\frac{1}{S}\sum\frac{\kappa^2}{\Delta x} - \frac{(\Sigma\kappa)^2}{S^2}\right]} \tag{19}$$

as the second term in brackets is small this becomes

$$\bar{l}=S\left\{1-\frac{P^2}{2E^2}\left[\frac{1}{S}\sum\frac{\kappa^2}{\Delta x}-\frac{(\Sigma\kappa)^2}{S^2}\right]\right\} \tag{20}$$

$$=S-\frac{P^2}{2E^2}\left[\sum\frac{\kappa^2}{\Delta x}-\frac{(\Sigma\kappa)^2}{S}\right] \tag{21}$$

7. PROPERTIES OF BEAMS BEARING UPON THE DESIGN OF THE LEVERS OF SCALES.

Generally the levers of scales are cantilever beams having concentrated loads at the ends.

In designing scales it is not sufficient to provide levers of sufficient strength to carry the load safely without breaking, but it is necessary that the levers be sufficiently stiff to preserve the multiplication of the scale so that the heavy loads will be weighed accurately.

It is desirable in both items of strength or stiffness that an efficient use be made of the material so that the lever will be the best possible for its weight. In order that this efficiency be realized, it is necessary that the section of the lever be varied from point to point according to the manner in which the external moment varies.

In cases where the stiffness of the lever is ample and the question of strength is the important item, a lever of uniform strength will give the most economical use of material. However, when there is no difficulty in securing requisite strength but there is difficulty in getting sufficient rigidity then it becomes debatable whether the extra material should be arranged in a lever of constant strength or of constant stiffness.

Owing to the lack of time and space only special forms of sections will be considered.

Some of the material presented here may possibly be found in textbooks on mechanics, but it is not practical to refer to them, as the material herein presented can be more readily worked out from the fundamental principles than it can be derived from an exploration of textbooks. The items of strength and stiffness will be studied for the four cases outlined below and numbered from 1 to 4, inclusive.

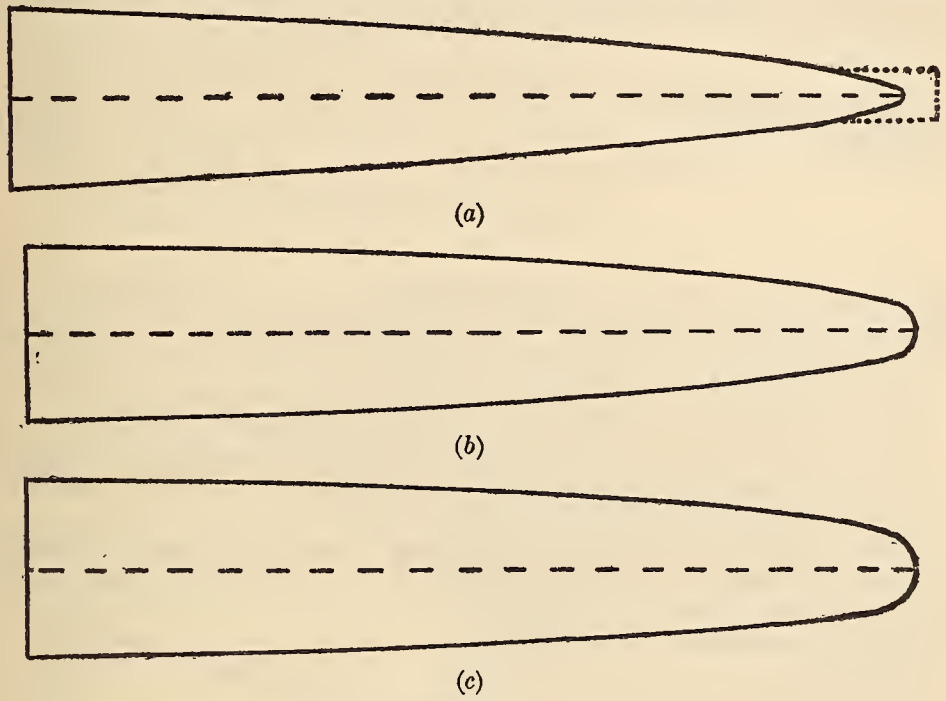
1. Beams of rectangular cross sections of constant width but varying depth.
2. Beams of rectangular cross sections of constant depth but with varying width.
3. Beams having sections of uniform shape or proportions.
4. Beams of constant width but with the vertical dimensions of the sections having a constant ratio to each other.

Beams of constant strength are those in which the maximum fiber stress, $\frac{Mz}{I}$, is constant for all sections of the beam as long as the elastic limit is not exceeded. The common theory of beams does not provide for conditions past the elastic limit, so that a beam of constant strength, as here defined, is not necessarily one which is as liable to fail at one point as another when it is tested to destruction.

It is particularly necessary that the levers of scales be not stressed beyond the elastic limit, as the constancy of the scales depends upon this, so that the limitations in theory correspond to the limitations in practice.

In the present subject, beams of constant or uniform stiffness throughout their length are defined as those in which $\frac{d^2y}{dx^2}$ is constant when x and y are the coordinates of the elastic curve.

Upon applying the well-known laws of mechanics the results given in figure 22, page 161, are obtained.



(*a*)

(*b*)

(*c*)

Fig. 19.

The notations employed in the table of equations are assigned as follows:

P = value of concentrated load.
l = length of lever.
E = Young's modulus.
b = breadth of beam.
b_m = maximum breadth of beam − breadth at the base.
z = distance from neutral axis to the most remote fiber.
z_m = maximum value of z (occurring at the base of the beam).
x = distance measured from the loaded end of the beam.
y = ordinate of the elastic line chosen so that when $y=0$, $x=l$.
y_m = maximum value of y occurring when $x=0$.
K = constant such that $I=Kz^4$ in cross sections of uniform proportions.
I = moment of inertia of section.

C = constant such that the area of section = $A = Cz^2$ in beams having sections of uniform proportions.

m = constant such that $I = mz^3$ in levers where the thickness, or breadth, is constant and the dimensions of the depth bear a constant ratio to one another.

G = constant that area in preceding case is given by $A = Gz^2$.

The profiles of the beams having the various properties as indicated by the equations for z are given in figures 19 to 21, inclusive. Taking up the results in order:

1. The profile of the beam for constant strength is given in figure 19 (a) and for constant stiffness is given in figure 19 (b). The first is a

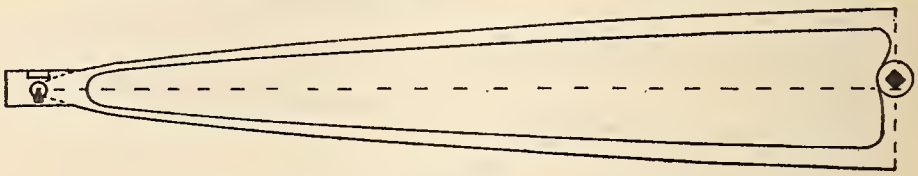


Fig. 20.

parabola and the second is a cubic parabola. It can be readily noticed that the condition corresponding to figure 19 (b) requires the greater amount of material. This last point will be considered in detail later.

2. Here the beam of constant strength is also the one of constant stiffness, the shape of the beam being indicated in figure 21.

3. For the beam of which the cross sections are constant in shape but vary in size the profiles for uniform strength and uniform stiffness are given in figure 19 (b) and (c) respectively.

In this case figure 19 (b) and (c) 2 and 3 do not represent beams of uniform thickness but beams in which a top view would show a plan similar to the profile. The curves are cubic and quadratic parabolas, respectively.

4. This case is just a more general case of 1. The profiles for beams of constant strength are shown in figures 19 (a) and 20 and for constant stiffness is given by figure 19 (b).

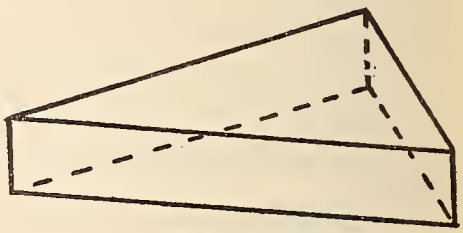


Fig. 21.

Figure 20 is drawn so as to show the appearance of a scale lever having an I-section complying with the conditions of 4.

Leaving aside for the moment the question of the practical construction of levers or beams corresponding to the preceding conditions, the question of beams of constant strength and stiffness will be compared.

For making the comparison it will be assumed that a certain amount of material is to be allowed in the lever, i. e., the lever is to weigh so much, and the relative merits in putting the material in a lever of constant strength or constant stiffness will be considered.

Levers can not be made indefinitely thin. The lever has to be provided with sufficient lateral stiffness to support side thrust to

which it may be occasionally subjected; to prevent the lever from buckling; to resist shearing forces in the web; and to assist in withstanding torsional forces.

Where rational principles can be followed, the lateral strength and rigidity to be provided for at the base of the beam will be a certain percentage of the normal strength and rigidity. This requirement is met in sections of uniform shape. The comparison between levers of constant strength and constant stiffness will therefore be made on the assumption that the sections of the two levers will be the same in shape at their bases.

Taking the cases up in their order; (1) if the sections are of the same shape then the breadth b will be proportional to z_m and can be written $b = qz_m$.

Designating the value of z_m for beams of constant strength by ${}_1Z_m$ and for beams of constant stiffness by ${}_2Z_m$ we have by hypothesis of equal weights or volume,

$$\frac{3}{4} b l {}_1Z_m = \frac{3}{2} b {}_2Z_m l$$

substituting for b

$$\frac{4}{3} q l {}_1Z^2{}_m = \frac{3}{2} q {}_2Z^2{}_m l$$

$${}_2Z^3{}_m = {}_1Z^2{}_m \frac{4 \cdot 2}{3 \cdot 3}$$

The ratio of the maximum deflections is given by—

$$R = \frac{\frac{P}{E} \frac{l^3}{q {}_1Z_m{}^4}}{\frac{3}{4} \frac{P}{E} \frac{l^3}{q {}_2Z_m{}^4}}$$

$$= \frac{4}{3} \frac{{}_2Z_m{}^4}{{}_1Z_m{}^4}$$

$$= \frac{4}{3} \frac{{}_1Z_m{}^4 \left(\frac{8}{9}\right)^2}{{}_1Z_m{}^4}$$

$$= \frac{4}{3} \cdot \frac{64}{81}$$

$$= 1.053$$

a gain of less than 6 per cent in stiffness in putting the material in a lever of constant strength.

The case under 2 need not be considered, as the two cases are identical.

Taking up (3) the constant C takes account of the relation just previously allowed for by q and we have

$$\frac{3}{5} C_1 Z_m{}^2 l = \frac{2}{3} C_2 Z_m{}^2 l$$

$${}_2Z_m{}^2 = {}_1Z_m{}^2 \frac{3}{5} \cdot \frac{3}{2}$$

The ratio of the deflection is given by—

$$R=\frac{\frac{3}{5}\frac{P}{E}\frac{l^3}{K_1 Z_m^4}}{\frac{1}{2}\frac{P}{E}\frac{l^3}{K_2 Z_m^4}}$$

$$=\frac{3}{5}\cdot\frac{2}{1}\cdot\frac{{}_2Z_m^4}{{}_1Z_m^4}$$

$$=\frac{6}{5}\cdot\frac{81}{100}$$

$$=0.97$$

Case (4) gives the same results as case (1), so the details will not be presented.

It is next desirable to compare the maximum fiber stress in the sections at the bases of the levers. In sections of constant shape I varies as Z_m^4. The maximum fiber stress $=\frac{MZ_m}{I}$ so that the maximum fiber stress varies inversely as Z^3.

Case (1) ratio of fiber stress in beam of constant strength to beam of constant stiffness:

$$R^1=\frac{{}_2Z_m^3}{{}_1Z_m^3}=\left(\frac{4\cdot 2}{3\cdot 3}\right)^{\frac{3}{2}}\frac{{}_1Z_m^3}{{}_1Z_m^3}$$

$$=0.84$$

Case (3):

$$R^1=\frac{{}_2Z_m^3}{{}_1Z_m^3}$$

$$=\frac{{}_1Z_m^3}{{}_1Z_m^3}\left(\frac{3\cdot 3}{10}\right)^{\frac{3}{2}}$$

$$=0.85$$

The following table can now be constructed giving ratios of the various properties of the beams:

Case.	Deflection.		Fiber stress.	
	Constant strength.	Constant stiffness.	Constant strength.	Constant stiffness.
1	1.05	1.00	1.00	0.84
2	1.00	1.00	1.00	1.00
3	.96	1.00	1.00	.85
4	1.05	1.00	1.00	.84

The result shows that there is no practical gain in placing the material in the form of a lever of constant stiffness, and it is preferable to put the material into levers of constant strength.

The unexpected result obtained in (3) shows that the lever of constant strength gives the least deflection.

As levers are commonly constructed, they have an I section. This section has been varied from point to point in more or less arbitrary fashion, some of which suggest cases (1), (3), and (4). By far, however, the commonest practice is to employ a constant flange section and varying depth. This gives a relation between z and x which has to be expressed as a cubic equation which is not susceptible to brief treatment. But the general conclusions derived from the preceding cases apply here and this design is used most economically when the beams are of uniform stiffness.

The question of the practical considerations involved in the application of the preceding will have to go over until some future date.

		Section	Width.	Z = ½ Total Depth.	Equation of the Elastic Line.	Y_m = Maximum Deflection.	V = Volume.
Rectangular Cross-section. Constant Width.	1.	Constant Strength	b = Constant	$Z = Z_m\sqrt{\frac{x}{l}}$	$y = \frac{P}{E}\frac{l^{3/2}}{bZ_m^3}\left(l^{3/2} - 3xl^{1/2} + 2x^{3/2}\right)$.	$\frac{P}{E}\frac{l^3}{bZ_m^3}$	$\frac{4}{3}blZ_m$
		Constant Stiffness	b = Constant	$Z = Z_m\sqrt[3]{\frac{x}{l}}$	$y = \frac{3}{4}\frac{Pl}{EbZ_m^3}\left(x^2 - 2lx + l^2\right)$.	$\frac{3}{4}\frac{P}{E}\frac{l^3}{bZ_m^3}$	$\frac{3}{2}blZ_m$
Rectangular Cross-section. Constant Depth.	2.	Constant Strength	$b = b_m\frac{x}{l}$	$Z = Z_m$	$y = \frac{3}{4}\frac{Pl}{Eb_mZ_m^3}\left(x^2 - 2lx + l^2\right)$.	$\frac{3}{4}\frac{P}{E}\frac{l^3}{b_mZ_m^3}$	b_mlZ_m
		Constant Stiffness	$b = b_m\frac{x}{l}$	$Z = Z_m$	$y = \frac{3}{4}\frac{Pl}{Eb_mZ_m^3}\left(x^2 - 2lx + l^2\right)$.	$\frac{3}{4}\frac{P}{E}\frac{l^3}{b_mZ_m^3}$	b_mlZ_m
Section of Constant Proportions.	3.	Constant Strength	$\propto Z$	$Z = Z_m\sqrt[3]{\frac{x}{l}}$	$y = \frac{3}{10}\frac{Pl^{1/2}}{EKZ_m^4}\left(3x^{5/2} - 2xl^{3/2} + 2l^{5/2}\right)$.	$\frac{3}{5}\frac{P}{E}\frac{l^3}{KZ_m^4}$	$\frac{3}{5}clZ_m^2$
		Constant Stiffness	$\propto Z$	$Z = Z_m\sqrt[4]{\frac{x}{l}}$	$y = \frac{Pl}{2EKZ_m^4}\left(x^2 - 2lx + l^2\right)$.	$\frac{1}{2}\frac{P}{E}\frac{l^3}{KZ_m^4}$	$\frac{2}{3}clZ_m^2$
Section of Constant Width, Depth Dimension Uniform in Proportion.	4.	Constant Strength	b = Constant.	$Z = Z_m\sqrt{\frac{x}{l}}$	$y = \frac{2}{3}\frac{Pl^{3/2}}{EmZ_m^2}\left(2x^{3/2} - 3xl^{1/2} + l^{3/2}\right)$.	$\frac{2}{3}\frac{P}{E}\frac{l^3}{mZ_m}$	$\frac{2}{3}qlZ_m$
		Constant Stiffness	b = Constant	$Z = Z_m\sqrt[3]{\frac{x}{l}}$	$y = \frac{Pl}{2EmZ_m^2}\left(x^2 - 2xl + l^2\right)$.	$\frac{1}{2}\frac{P}{E}\frac{l^3}{mZ_m^2}$	$\frac{3}{4}qlZ_m$

Fig. 22.

The equations given in figure 22 will serve to show some interesting facts in regard to the deflections.

First, with a given load, or pull on the end of the lever, and with a given section at the thickest part, the deflection will be proportional to the cube of the length.

Secondly, suppose one arm of the lever to be fixed in length and that the load on that arm is fixed. The load on the other lever arm will vary inversely with the length of that arm, the result being that the deflection will be proportional to the square of the length of the arm. This may be expressed—the deflection of the long arm is to the deflection of the short arm as the square of the long arm is to the square of the short arm. This is also practically true in most levers which are not designed according to any fixed plan.

For instance, in one lever the deflection of the two arms was determined by integrations, etc., made by graphical means. When fully

loaded the deflection for the long arm came out 0.222 inch and the short arm 0.0171 inch; upon dividing the deflection for the long arm (0.222) inch by the square of the ratio of the long arm divided by the short arm the result came out 0.0171, as was obtained before.

In general it can not be expected that such a close agreement would be obtained, but the results will be close enough for most practical purposes.

8. LEVEL INSTRUMENTS FOR MEASURING DEFLECTIONS AND FLEXURE.

The causes of the errors and variations in the results obtained on large weighing scales are known in a general way, but the exact source of various troubles and the particular amount contributed from specific items is not always clearly determined. The result is that a great deal of the knowledge is unnecessarily speculative in character, and in attempting to design scales in such a way as to reduce the inaccuracies that arise, the effort is made more or less blindly. For instance, it is known that deflections in the foundation, levers, and other parts cause variations to occur in the scale, and these difficulties are reduced by stiffening the respective parts. However, this stiffening is usually done in a more or less arbitrary manner and often without any knowledge of the particular values involved or the amount of trouble contributed from various sources.

In order to add to the knowledge about such matters, two instruments were designed for measuring some of the changes that take place under load, such as bending and tilting of the levers, twist of the levers, bending and yielding of the bridge, foundations, and parts, etc.

The instruments consist of duplicate devices, the construction of which can be seen in figure 23.

The instrument consists of the level vial V, mounted upon the table T. The table T is pivoted at the point P to an upright bracket B attached to the base G, and supported at the other end by means of the micrometer screw M, which extends through the table and rests on a hardened steel bearing-plug in the base.

The instrument is used by clamping it to the part to be investigated; the bubble is brought to some fixed point by means of the micrometer screw, and a reading of the micrometer is made and recorded. The scale or mechanism is then loaded, etc., the deflection of the part throws the bubble out of level, the bubble is then restored to its zero reading by turning the micrometer screw, after which a second reading is made and recorded.

The difference in the two readings of the micrometer gives the deflection of the parts in terms of the change in angle it makes with the horizontal.

When the vertical deflections of parts such as foundations are to be investigated it is necessary to convert this deflection into an angular deflection of some sort. This is readily done by using a straddle bar, which can be attached at one end to the part being tested and at the other end attached to some reference object. The instrument is then placed upon this bar and used in the manner described.

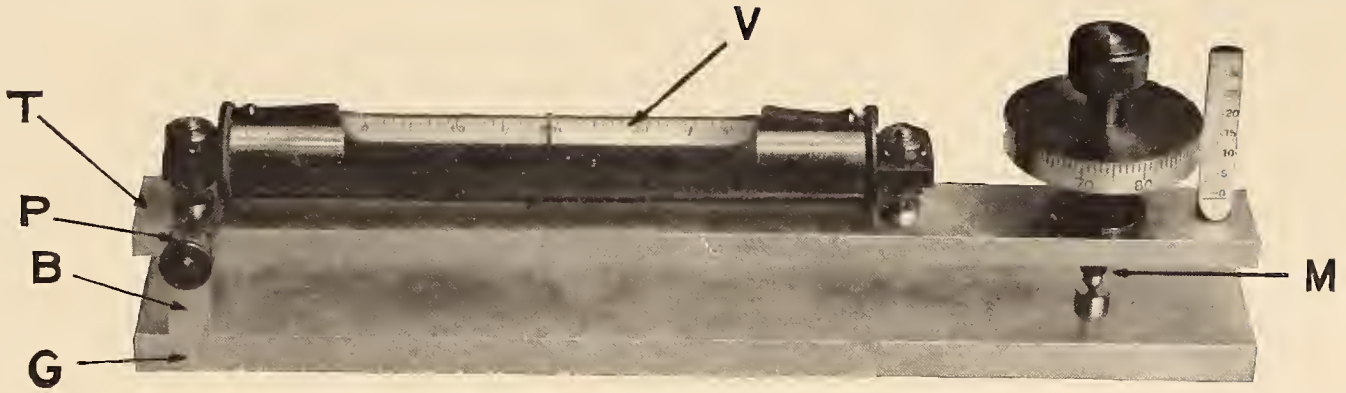


Fig. 23.—*Instrument for measuring changes of level.*

The normal action of the lever under load is two kinds—first, the lever bends under the effect of the transverse load; secondly, the lever tilts under the effect of the other levers and parts. This is illustrated diagrammatically in figure 24 *a* and *b*.

In testing any particular lever the instruments are mounted as indicated. The tilt of the lever can be defined as the angle through which the portion at the center knife edge turns. The bending of the lever is the difference between the change at A and the change at B.

The actual deflection of the neutral axis is only obtained indirectly. When the instruments are used as illustrated they measure the slope of the elastic line. However, the actual deflections can be measured with reference to some point in the pit by using the

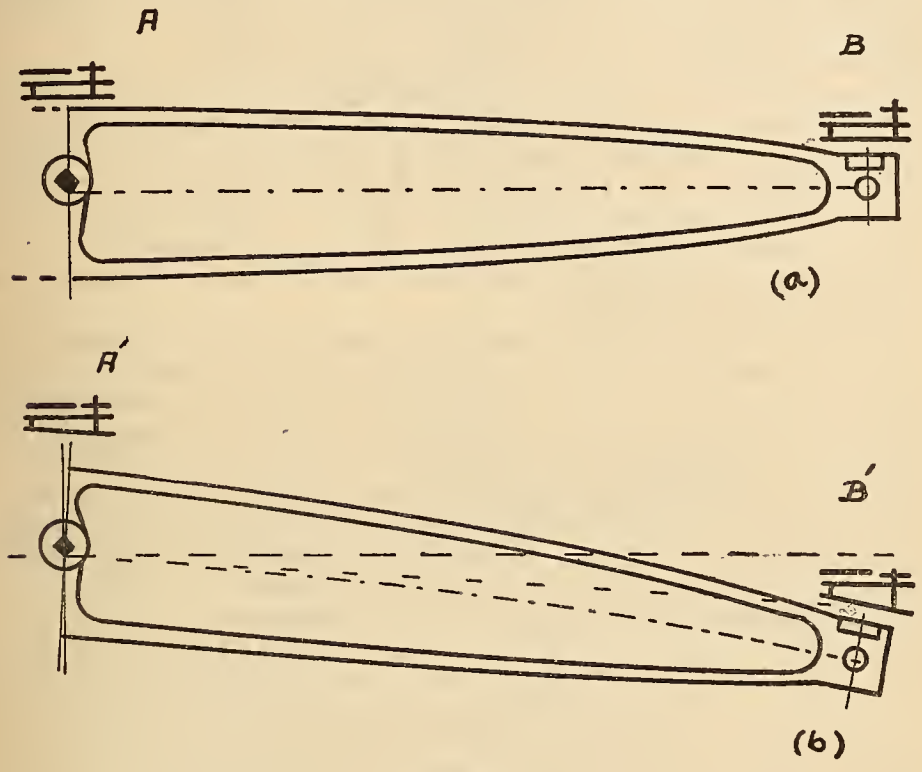


Fig. 24.

"straddle" bar mentioned previously; when this is done the deflections include the yield of all the parts, foundations, etc., and the effects of the tilting of the lever.

There is considerable advantage for some of the work in having the instruments measure the slope. Referring to the common theory of beams the differential equation used as the starting point is

$$\frac{d^2y}{dx^2}=\frac{M}{EI},$$

the notation being the same as expressed in article 5, page 150. In order to obtain the relations of y to the other quantities, such as load, etc., it is necessary to make two integrations and add the proper constants of integration.

By using the slope as measured by the instruments it is only necessary to make one integration, and all of the analytical expressions connecting the load, fiber stress, etc., are expressed in simple equations.

The advantage of the instruments consists in their simplicity in use and application. The bubbles are very sensitive and no auxiliary mechanism is required to connect them with each other in any manner. The disadvantage of the instruments is that they do not record instantaneous values and the scale has to be at rest while the measurements are being made. The levels are excellent in character and were obtained through the courtesy of the Coast and Geodetic Survey. Owing to the sensitiveness of the levels the movement of the bubble is slow and no attempt is made to bring it to a particular position; the position of the bubble is read and a correction corresponding is applied to the reading of the micrometer.

The instrument is such as to be useful in determining the flexure of beams under transverse forces. The instruments are sensitive, and aside from the fact that the observed values can be used in simple equations the fact that any effect produced by the yielding of the supports is eliminated by the use of two instruments makes them particularly adaptable for some kinds of investigations.

The instruments are to be used as a part of the test car equipment of the Bureau of Standards.

The instruments are particularly adapted for the measurement of torsional strains in levers. Conditions for the development of strains of this character are particularly favorable in the short end of the fifth levers of track scales when the load is unequally distributed on both halves of the scale.

With the use of these instruments the magnitude of the torsional strains becomes much more accessible as the calculation is involved in difficulties which are aggravated by a general lack of knowledge as to what the conditions are in a scale in service.

The instruments have been given a preliminary tryout which demonstrated their suitability in a very decided way. The deflections were very readily obtained and less time was required to set and read the micrometers than was expected. The torsional strains were measured on the short end of the fifth lever. Referring to figure 24, if the instruments are turned in their horizontal plane at right angles to the position indicated, they will measure the torsional strains. The torsional strains found were very pronounced and in this particular case the bearings yielded under the twisting effect to a considerable extent, indicating that serious trouble might come from this source. As an interesting incident to this tryout it was found that with a load centered on the scale there was a very pronounced twist in the fifth lever which was subsequently explained by finding that one of the bearing links was broken, causing the centered load to be unequally divided between the two halves of the scale.

9. THE EQUAL ARM BALANCE.

The following is a simple theory of the balance. In developing the expression a few approximations are made which are perfectly safe to consider in balances as they are ordinarily used. The variation from the assumed approximation in most cases could not be detected in the observations that ordinarily could be made on the balance.

The resulting expressions allow the data obtained from the observations to be plotted in the form of straight or slightly curved lines. From the slopes and intercepts of these lines all the information available in data can be obtained most readily. The fact that the resulting lines are straight or nearly so facilitates drawing them in the plot.

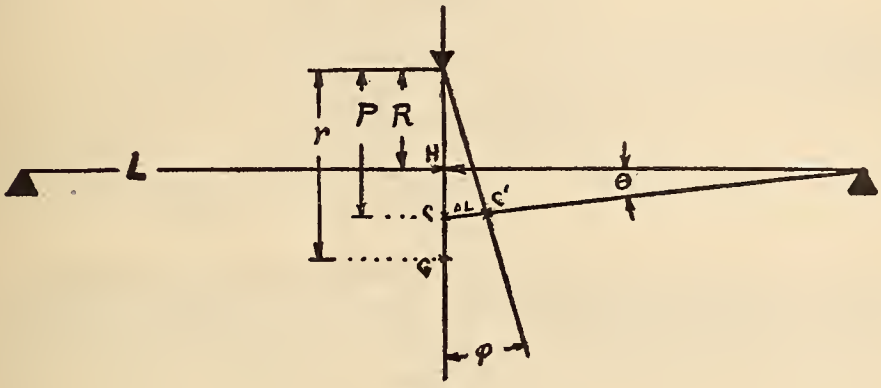


Fig. 25.

The following notation can be made clear by the use of figure 25.

m = mass of the beam including pans and dead load.

M = mass of the load which is divided among the two pans.

L = length of the balance arm.

G = position of the center of gravity of the beam including pans.

H = position of the effective center of gravity of the load placed on the pans and balanced.

C = position of the center of gravity and load combined.

R = distance of K from the center knife edge.

r = distance of G from the center knife edge.

P = distance of C from the center knife edge.

I = moment of inertia of beam and pans.

g = value of gravity.

(a) *Statics.*—

$$P = \frac{MR + mr}{M + m} \tag{1}$$

When an increment of mass ΔM is added to the right-hand pan the center of gravity moves from the point C to the point C′, changing its position an amount ΔL.

The new position of equilibrium will occur when the point C′ is immediately beneath the central knife edge. This causes the beam to turn through an angle ϕ.

In balances as they are ordinarily designed and used the angles indicated in the figure by θ and ϕ are small. θ is particularly small so that the angle ϕ may be put

$$\phi = \frac{\Delta L}{P} \tag{2}$$

$$\Delta L = \frac{L - \Delta L}{M+m} \Delta M \tag{3}$$

This is practically equivalent to

$$\Delta L = \frac{L}{M+m} \Delta M \tag{4}$$

Substituting for ΔL and P in equation (2) we have

$$\phi = \frac{L \cdot \Delta M}{(M+m)} \quad \frac{(M+m)}{(MR+mr)} \tag{5}$$

$$\phi = \frac{L \cdot \Delta M}{MR+mr} \tag{6}$$

If we call the weight required to deflect the beam through a unit angle the sensibility reciprocal and denote it by Sr then we have

$$Sr. = \frac{\Delta M}{\phi} \tag{7}$$

$$Sr. = \frac{MR+mr}{L} \tag{8}$$

If R is zero ie. if the knife edges remain in a straight line the sensibility reciprocal and sensibility is constant.

In the general if the sensibility reciprocal is plotted against the load M and there is no flexure present the resultant curve will be a straight line the slope of which is

$$\frac{d(Sr.)}{dM} = \frac{R}{L} \tag{9}$$

This enables the value of R to be determined experimentally.

If flexure is present in the beam to any extent, its magnitude should be proportional to the load and R can be expressed

$$R = R_o + KM \tag{10}$$

where R_o is the value of R at zero load and KM gives the increase in R produced by the load.

In the same way we can express for r

$$r = r_o + VM \tag{11}$$

in which r_o is the initial value of r and V is a constant corresponding to the constant K given in equation (10).

Substituting equations (10) and (11) for R and r in equation (8), we have

$$Sr. = \frac{MR_o + KM^2 + mr_o + Vm\,M}{L} \tag{12}$$

This last expression no longer gives a linear relation between Sr and M. The corresponding plot would be curved and the amount of curvature would indicate the flexure present.

Deriving

$$\frac{d(Sr.)}{dM} = \frac{R_o + 2Km + Vm}{L} \tag{13}$$

$$\frac{d^2(Sr.)}{dM} = \frac{2K}{L} = \text{constant} \tag{14}$$

By taking the second derivative of the curve of Sr vers. M, the value of K can be determined, after which the value of $R_o + rm$ can be computed.

In a great many balances the value of V may be neglected and the facts can be represented by

$$Sr = \frac{MR_o + KM^2}{L} \tag{17}$$

In cases where flexure of all kinds is negligible equation (8) holds.

(b) *Dynamics.*—The period of a balance is given by the expression

$$T = 2\pi\sqrt{\frac{I_o + ML^2}{g(RM + mr)}} \tag{18}$$

where I_o is the moment of inertia of the beam and pans and ML^2 is the moment of inertia contributed by the load. (This neglects any pendulum action of the pans, etc.)

Substituting for $(MR + mr)$ by means of equation (8), we have

$$T = 2\pi\sqrt{\frac{I_o + ML^2}{gLSr}} \tag{19}$$

squaring

$$T^2 = 4\pi^2\frac{(I_o + ML^2)}{gLSr} \tag{20}$$

$$\frac{T^2Srg}{4\pi^2} = \frac{I_o + ML^2}{L} \tag{21}$$

Plotting $\frac{T^2Srg}{4\pi^2}$ against M, a straight line should be obtained whether flexure is present in the beam or not.

The slope of this line is

$$\frac{d\left(\frac{T^2Srg}{4\pi^2}\right)}{dM} = \frac{L^2}{L} = L \tag{22}$$

From the above the following table can be made out:

	Unknown	
Observed and known quantities	Obtained from (1) intercepts	Obtained from (2) slopes
$Sr.$	I_o	R_o
T	mr	r
M		K
		V
		L

In the equations developed above, the angular measure is in radians.

If the deflections, sensibility, etc., are measured in the divisions passed over by a pointer, the same characteristic relations will be present, but care must be taken to avoid confusion. For instance, measuring Sr in terms of the weight required to move the pointer over one division would not give L in equation (22), but a value which was to L as the scale divisions are to a radian.

10. A SIMPLE THEORY OF THE COMPOUND LEVER SCALE.

Under section 9 a simple theory of the balance was worked out. The present subject will give the development of a corresponding theory of a compound lever scale showing that the characteristics are the same as those obtained for the balance.

In the present theory only first order effects are considered, and the levers and parts are considered to be rigid and to oscillate through very small angles.

The final results can be easily modified to take in first order effects of flexure as was done in the theory of the balance, but any attempt to consider second order effects complicates the problem enormously.

In compound lever scales where the load is balanced by counterpoise weights applied on a beam the vibratory motion of the beam and levers is practically identical in character with the vibration of a pendulum, and the scale as a whole has general properties which correspond to a single beam or an even arm scale.

The period of a pendulum depends upon its moment of inertia about the axis or point of suspension; the moment of restitution which tends to restore the pendulum to its position of equilibrium, which is proportional to the displacement of the pendulum; friction which tends to damp the movement of the pendulum.

In general where a rigid body executes simple harmonic motion about an axis we can put:

I = moment of inertia of the body about the axis of rotation.

B = the coefficient of restitution or the moment developed per unit angle displacement tending to return the body to its position of equilibrium.

Q = frictional moment developed per change of angle per second (friction assumed to obey this law).

θ = angle of displacement from the position of equilibrium.

The differential equation of motion becomes

$$I\frac{d^2\theta}{dt^2}+B\frac{d\theta}{dt}+Q\theta=o$$

or

$$\frac{d^2\theta}{dt^2}+\frac{B}{I}\frac{d\theta}{dt}+\frac{Q}{I}\theta=o$$

Using the ordinary means for solving this equation the following solution is obtained:

$$\theta=e^{-\frac{Bt}{2I}}A\cos t\sqrt{\frac{Q}{I}-\left(\frac{B}{2I}\right)^2}$$

and the period is therefore

$$T=2\pi\sqrt{\frac{I}{Q-\frac{B^2}{4I}}}$$

This formula applies to the levers of scales individually; in this case I is the moment of inertia of the lever about its own fulcrum knife edge, which depends upon the mass of the lever and its distribution relative to the axis of oscillation; B depends upon the distance of the center of gravity of the lever and load from the fulcrum knife edge, and upon the mass of the lever and the value of the force of gravity; Q depends upon the various factors which produce friction.

In this case the value of the period T would be given for the lever oscillating alone. In a scale the levers are all connected so that they oscillate in unison with each other and the load and counterpoise weights.

The period of oscillation for the aggregation can be determined by considering the effect of the properties of all the levers in reference to the way they affect some particular lever.

In this case as a matter of convenience all quantities will be considered in reference to the beam. This selection is arbitrary as if correct results are obtained and if the method is correct it will be a matter of indifference which lever is considered as the reference lever as far as ultimate results are concerned.

Fixing our attention on the beam, the restoring moment, friction moment, and moment of inertia of any other lever will be considered from the way in which they affect the similar properties of the beam. That is, we might theoretically replace the lever system with two parallel independent lever systems in one of which inertia was present, and in the other lever system the forces of restitution, friction, etc., would be present and connected to the inertia through the beam to which all the quantities may be referred.

From this standpoint the moment of inertia of any lever acting through its connections contributes to the effective moment of inertia of the beam, and the same is true in a like manner for the restoring moments and friction. In considering how the properties of any particular lever affect the corresponding properties of the beam the intermediate levers need only to be considered as a connecting frame-

work which maintains a fixed relation between the angular displacements and velocities of the lever considered and the beam.

Let the levers in the series forming a scale be numbered in their order from the beam to the load, the beam being designated by (1). Figure 26 indicates the general notation of the scale parts.

Let B_1', B_2', B_3', ··etc., be the restitution coefficients of the various levers referred to their own axes, and let B_1, B_2, B_3, etc., be the resti-

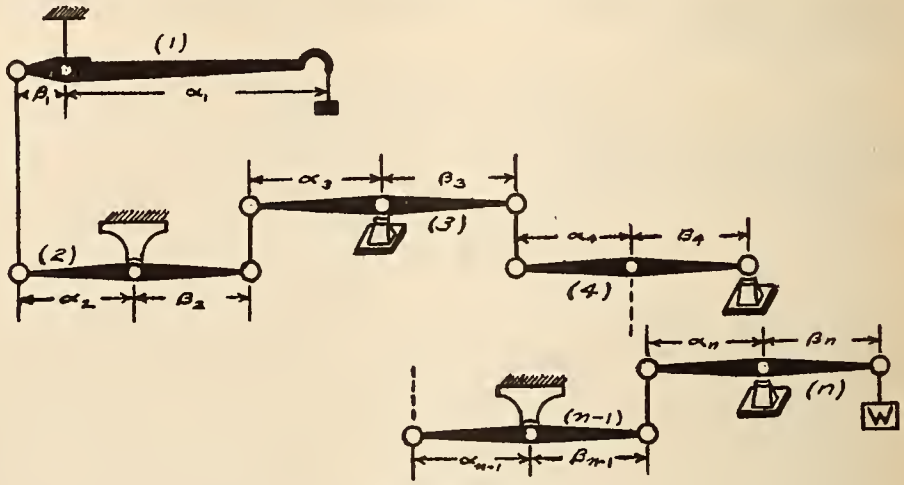


Fig. 26.

tution coefficients of levers 1, 2, 3, etc., referred to their effect on the beam; then

$$B_1 = B_1'$$

$$B_2 = B_2'\left(\frac{\beta_1}{\alpha_2}\right)^2$$

$$B_3 = B_3'\left(\frac{\beta_1\beta_2}{\alpha_2\alpha_3}\right)^2$$

. . . . . .

$$B_n = B_n'\left(\frac{\beta_1\beta_2\cdots\beta_{n-1}}{\alpha_2\alpha_3\cdots\alpha_n}\right)^2$$

That the relations given are correct can best be verified by taking one particular case as an illustration and working it out in detail.

Consider the coefficient of restitution for lever (3). With respect to its own axis this is B_3'. Let the beam be deflected through an angle ϕ_1 and let the corresponding angle of deflection in lever (3) be ϕ_3. Then the restoring moment developed in lever (3) is $B_3'\phi_3$. This force can be considered as sustained by the beam through the connecting framework; accordingly this produces a force in the connections between levers (2) and (3) of $\frac{B_3'\phi_3}{\alpha_3}$ and the force transferred to the beam is finally

$$B_3'\phi_3\frac{\beta_2}{\alpha_2\alpha_3}$$

This force corresponds to a moment in the beam of the force acting on the beam times the distance of its point of application from the fulcrum point or

$$B_3'\phi_3\frac{\beta_1\beta_2}{\alpha_2\alpha_3}$$

The restoring moment per unit angle of this referred to the beam is this last quantity divided by the angle through which the beam is deflected or

$$B_3=B_3'\frac{\phi_3}{\phi_1}\frac{\beta_1\beta_2}{\alpha_2\alpha_3} \tag{7}$$

now it is readily established that

$$\frac{\phi_3}{\phi_1}=\frac{\beta_1\beta_2}{\alpha_2\alpha_3} \tag{8}$$

so that

$$B_3=B_3'\left(\frac{\beta_1\beta_2}{\alpha_2\alpha_3}\right)^2 \tag{9}$$

The same reasoning applies to the other terms, which can be verified in detail.

Similarly if the moments of inertia of the various levers with respect to their own axes are I'_1, I'_2, I'_3, etc., and they can be considered to contribute to the inertia of the beam such that

$$I_P=M_P\alpha_1^2$$

$$I_1=I_1'$$

$$I_2=I_2'\left(\frac{\beta_1}{\alpha_2}\right)^2$$

$$I_3=I_3'\left(\frac{\beta_1\beta_2}{\alpha_2\alpha_3}\right)^2$$

. . . . . .

$$I_n=I_n'\left(\frac{\beta_1\beta_2\cdots\beta_{n-1}}{\alpha_2\alpha_3\quad\alpha_n}\right)^2$$

$$I_L=M_L\left(\frac{\beta_1\beta_2\cdots\beta_n}{\alpha_2\alpha_3\cdots\alpha_n}\right)^2$$

The B''s are functions of the load which has to be considered in all cases. Keeping in mind the distinction between mass and weight, the B''s in respect to any beam are composed of two parts, one is the weight of the beam times the distance of the center of gravity of the beam from the fulcrum knife-edge, and the other is the sum of the forces produced by the load acting at both ends of the lever times the distance between the fulcrum knife-edges and the resultant of the two forces. The value for B is expressed in greater detail in equation in the latter part of this chapter. I_P is the moment of inertia contributed by the counterpoise weight and I_L is effective inertia of the load with respect to the beam. M_P stands for the mass of the counterpoise weight, and M_L stands for the mass of the load applied at

the last knife-edge. In using English units care should be exercised not to confuse the mass units with the weight units. These relations will be verified by an illustration as was done for the R's.

The value of I for any part is such that when the part is rotating with an angular velocity ω the kinetic energy is $\frac{I\omega^2}{2}$.

Let the value of ω for lever (3) be denoted by ω_3 and for the beam be denoted by ω_1 then in any given stage of motion by definition the kinetic energy being the same from any viewpoint

$$\tfrac{1}{2}I_3'\omega_3^2=\tfrac{1}{2}I_3\omega_1^2$$

$$I_3=I_3'\left(\frac{\omega_3}{\omega_1}\right)^2$$

In a similar manner it can be shown that if Q'_2, Q'_2, Q'_3, etc., are the friction coefficients of the various levers with respect to themselves and Q_1, Q_2, Q_3, etc., are the friction coefficients interpreted as affecting the beam, then

$$Q_1=Q_1'$$

$$Q_2=Q_2'\left(\frac{\beta_1}{\alpha_2}\right)^2$$

$$Q_3=Q_3'\left(\frac{\beta_1\beta_2}{\alpha_2\alpha_3}\right)^2$$

. . . . . .

$$Q_n=Q_n'\left(\frac{\beta_1\ \beta_2\ \ldots\ \beta_{n-1}}{\alpha_2\alpha_3\ \ldots\ \alpha_n}\right)^2$$

If we now put

$$I=\Sigma I_m$$

$$=I_P+I_1+I_2+\ \ldots\ I_n+I_L$$

$$B=\Sigma B_m$$

$$=B_1+B_2+\ \ldots\ B_n$$

$$Q=\Sigma Q$$

$$=Q_1+Q_2+X_3\ \ldots\ Q_n$$

the period of the scale becomes

$$T=2\pi\sqrt{\frac{\Sigma I_m}{\Sigma Q_m-\frac{(\Sigma R_m)^2}{4I}}}$$

This result can be obtained from general mechanical principles. However, it is thought that the method employed here will enable some individuals to follow the matter who would be unable to follow the development if more general principles were used.

The matter of scale sensibility will now be considered. For our purpose the sensibility of a scale can best be defined as the deflection in radians produced on the beam per unit of weight added to the scale

platform and the sensibility reciprocal $Sr.$ or S^{-1}, the reciprocal of sensibility, is therefore the weight required per radian deflection. The resulting definition for sensibility reciprocal conforms in character to the definition given by the Bureau of Standards, except here the value is referred to a fixed angle—the radian—and not to the trig-loop which represents varying angles in different scales.

The quantity which lends itself with the greatest advantage to use in considering the properties of a scale is this sensibility reciprocal, which will be used instead of the sensibility.

In any scale balanced at zero load the levers can be considered as individually balanced and the parts and attachments can be included as a part of the levers. Considering now the general case of any lever in a scale, let the lever considered be the m'th lever in the scale counting from the beam and let there be n levers in the series from the beam to the load. The various quantities will be referred to the levers to which they belong by being given subscripts corresponding to the number of the lever.

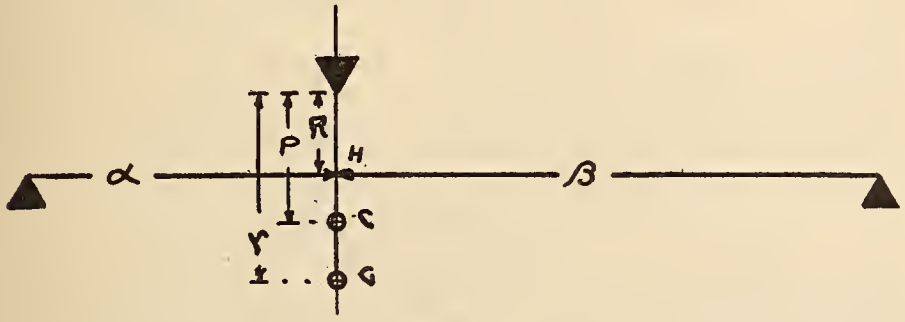


Fig. 27.

Referring to figure 27, which represents any lever, the center of gravity of the lever and attachments is indicated at the point G at a distance r from the fulcrum knife-edge.

When a load is balanced upon the scale it produces a force W_a at the end of arm α and a force of W_β at the end of arm β, and these forces will have an effective resultant or center of gravity at the point H, at a distance R from the fulcrum knife-edge.

The combined action is to give a resultant or effective center of gravity at the point c at a distance P from the fulcrum knife-edge.

For the m'th lever the relations can be expressed, where W_m is the weight of the lever,

$$P(W_{\alpha m}+W_{\beta m}+W_m)=(W_{\alpha m}+W_{\beta m})R+W_m r$$

$$P=\frac{R(W_{\alpha m}+W_{\beta m})+W_m r}{W_{\alpha m}+W_{\beta m}+W_m}$$

If this lever now be deflected through a small angle φ_m such that sin $\varphi_m \equiv \varphi_m$ there will be a restoring moment produced equal to

$$D_m{}^1=P(W_{\beta m}+W_{\beta m}+W_m)\varphi_m$$

or

$$D_m{}^1=[(W_{\alpha m}+W_{\beta m})R+W_m r]\phi_m$$

If this restoring moment is sustained by the beam, then the moment produced in the beam is

$$D_m = D_m{}^1 \frac{\beta_1 - - - \beta_{m-1}}{\alpha_2 - - - - \alpha_m} = [(W_{\alpha m} + W_{\beta m})R + W_m r] \frac{\beta_1 - - - \beta_{m-1}}{\alpha_2 - - - - \alpha_m} \varphi_m$$

Let φ_1 be the angular deflection of the beam corresponding to an angular deflection of φ_m in the mth lever, then

$$\varphi_m = \frac{\beta_1 - - - \beta_{m-1}}{\alpha_2 - - - - \alpha_m} \varphi_1$$

and equation (33) becomes

$$D_m = [(W_{\alpha m} + W_{\beta m})R + W_m r_m] \left(\frac{\beta_1 - - - \beta_{m-1}}{\alpha_2 - - - - \alpha_m} \right)^2 \varphi_1 \qquad (35)$$

$W_{\alpha m}$ and $W_{\beta m}$ are proportional to the load W, which is applied on the platform of the scale at the nth lever, and it is readily seen that

$$W_{\beta m} = W \frac{\beta_{m+1} - - - \beta_n}{\alpha_{m+1} - - - \alpha_n}$$

$$W_{\alpha m} = W_{\beta m} \frac{\beta_m}{\alpha_m}$$

$$W_{\alpha m} + W_{\beta m} = W \left(\frac{\beta_{m+1} - - - \beta_n}{\alpha_{m+1} - - - \alpha_n} \right) \left(1 + \frac{\beta_m}{\alpha_m} \right)$$

$$= W \left(\frac{\beta_m \beta_{m+1} - - \beta_n}{\alpha_{m+1} - - - \alpha_n} \right) \left(\frac{1}{\beta_m} + \frac{1}{\alpha_m} \right)$$

The moment per unit angle deflection produced is $\frac{D_m}{\varphi_1}$ and this is the coefficient of restitution B_m, referred to in the period of the balance, and substituting for $W_{\alpha m}$ and $W_{\beta m}$ in equation (35) and dividing by φ_1 we have

$$B_m = \frac{D_m}{\phi_1} = \left\{ W \left(\frac{\beta_m - - - - - \beta_n}{\alpha_{m+1} - - - \alpha_n} \right) R_m \left(\frac{1}{\beta_m} + \frac{1}{\alpha_m} \right) + W_m r_m \right\} \left(\frac{\beta_1 - - - \beta_{m-1}}{\alpha_2 - - - - \alpha_m} \right)^2$$

putting $\frac{\beta_1 \cdot \beta_2 - - - \beta_n}{\alpha_1 \alpha_2 - - - \alpha_n} = F$, it can be seen that multiplying the first term in the brackets by $\frac{\alpha_1}{\alpha_1}$ there results

$$B_m = F W \alpha_1 R_m \left(\frac{1}{\alpha_m} + \frac{1}{\beta_m} \right) \left(\frac{\beta_1 - - - \beta_{m-1}}{\alpha_2 - - - - \alpha_m} \right) + W_m r_m \left(\frac{\beta_1 - - - \beta_{m-1}}{\alpha_2 - - - - \alpha_m} \right)^2$$

and the effect from all of the levers is

$$B = B_1 + B_2 + - - - B_n$$

$$= W F \alpha_1 \sum_{m=1}^{m=n} \left(\frac{1}{\beta_m} + \frac{1}{\alpha_m} \right) \frac{\beta_1 - - - \beta_{m-1}}{\alpha_2 - - - - \alpha_m} + \sum_{m=1}^{m=n} W_m r_m \left(\frac{\beta_1 - - - \beta_{m-1}}{\alpha_2 - - - - \alpha_m} \right)^2 \qquad (44)$$

or

$$B = W K_1 + K_2 \qquad (45)$$

where K_1 and K_2 are the constants derived from the summations as may be determined by comparing equation (45) with equation (44).

Now suppose that an increment of load ΔW is added to the platform. In order to avoid confusion, we will assume that this ΔW is applied on the load knife-edge of a set of weightless, massless levers running parallel to the other levers. This will produce a moment on the beam of $\alpha_1 F \Delta W$, and the lever system will deflect until this moment is balanced by the moment developed in equation (45), or

$$\alpha_1 F \Delta W = \varphi_1 B$$

$$S^{-1} = \frac{\Delta W}{\varphi_1} = \frac{B}{\alpha_1 F}$$

$$S^{-1} = W K_1 + \frac{K_2}{\alpha_2 F}$$

This expression for the sensibility reciprocal is of the same character as that found for the simple theory of the balance, i. e., it varies linearly with the load W.

The factors K_1 and K_2 are a result of a summation of quantities derived from various levers. As the demonstration was outlined, quantities derived from levers in which the centers of gravity are above the knife-edge will have to take a negative sign. And an effect of one character in one lever can be counteracted by an opposite characteristic in another lever, such as the beam.

This is mentioned particularly, as frequently designers have taken extreme care at considerable cost to have the center knife-edge of a lever at or near the center of gravity of the lever when any difficulty caused by having the knife-edge too far above or below the center of gravity can be generally corrected in the beam.

A word of warning will be given in regard to obtaining experimental values of S^{-1} or lever scales which have several points of support. The theory indicates that when S^{-1} is plotted against the load a straight line should result.

In platform scales the elements of the four receiving levers may be different, and considerable irregularity will frequently be observed, as with varying loads the distribution between the levers will vary both on account of the spring of the parts and on account of stacking the load on the platform in an irregular manner.

DISCUSSION.

Mr. NEALE. Mr. Chairman, I would like to say regarding the paper that while it teaches undoubtedly a vital and important lesson, it brings to my mind the very thing that the Secretary of Commerce touched upon this morning in speaking about the fact that truth must first be learned and then translated into workable units. Of course, in the case of a somewhat elaborate and extensive description, we must appreciate that if it does overreach us, it is there and it is our aim, of course, to draw all we can out of it.

I would like to make this suggestion, however: I believe—and this I think Mr. Briggs will take in good part—that if in conjunction with

a very beautiful and scientific elaboration of this kind, and the figures that he draws on the board, the old-fashioned levers with which we are familiar could be jointly thrown on the screen, it would really tell a more interesting story to many who have not been taught to read in lines and figures. That is only a suggestion, Mr. Briggs.

Mr. BRIGGS. Mr. Chairman, the suggestion of Mr. Neale in regard to having the diagrams constructed to show the relations of the various parts, using the outlines of the old-fashioned levers, is indisputably a good one. Unfortunately I was not aware that a lantern was to be available, so no slides were constructed. I further expected to have an opportunity to draw the figures on the board before the paper was given. The unexpected change in the order of the program did not allow this to be done and the demonstration suffered as a consequence.

Mr. Neale, as I understood it, just made the point that there were practical applications possible of what appears to be somewhat complicated demonstrations. In the way of corroboration and of emphasizing the practical application it may be stated that the section on the effect of rounding the knife-edges and its relation to the change in the effective range lines of the lever was to affect a reconciliation between certain practices found good by experiment and certain simple theoretical considerations which apparently did not agree.

That is, there was a lack of agreement between certain practices of practical scale men and the theories commonly accepted by them, and the search for the lack of harmony resulted in the article just mentioned.

The CHAIRMAN. I want to say, in regard to the last paper, that in our efforts to accommodate the larger crowd our facilities have not been as good as we expect them to be in the future. We did not know until a few days ago that we could occupy this room, so that the darkening of the windows and all that is temporary; and there has been a great rush of work in other lines. In the future our papers will be illustrated by working models. The art of explaining complicated mechanisms in simple language is a very difficult one, but we will try to provide better facilities for that hereafter. It does not take away from the importance of the theoretical discussion; at the same time, if we can do anything to make it plainer, we will do so in the future.

Mr. WALDRON. Mr. Chairman, before we adjourn for lunch, I would like to ask our secretary, Mr. Fischer, to kindly have on exhibition here a sample of those gasoline cans that are supposed to hold 5 gallons but in reality hold only 3; also a sample of the many thousand baskets that we had in our State before the department was created.

The SECRETARY. I will be very glad indeed to comply with that suggestion. The photographer told us this morning that he had just finished making some photographs of that can; if it had not been for that, I would have had it on exhibition before. I think that is one of the most startling samples of fraudulent measure I have ever seen, and I am very glad indeed that Mr. Waldron reminded me of having it where it could be seen.

(Thereupon, at 12.45 p. m., a recess was taken for luncheon.)

FIFTH SESSION (AFTERNOON OF FRIDAY, MAY 16, 1913).

The conference reassembled at 2.15 p. m., Mr. S. E. Strode presiding.

The ACTING CHAIRMAN. The secretary desires to make an announcement.

The SECRETARY. I have been requested by Mr. Mikesell to state that the committee on resolutions is now meeting in the room on the right, and that they will be glad to receive any resolutions which any member of this conference may propose.

Mr. FINE. I would like to ask a question, as long as the resolutions committee is in session now. I asked at the meeting yesterday if this conference would go on record recommending to each State that all city sealers be under the supervision of the State.

The SECRETARY. Make that suggestion to the chairman of the committee, Mr. Fine.

FUNCTIONS OF A STATE SEALER.

By H. H. HENRY, *Commissioner of Weights and Measures, State of Vermont.*

Before attempting to give my views on the functions of a sealer, I wish to apologize to the conference for being thrust upon them in this matter, pleading guilty to the fault of having suggested this particular subject but not to any purpose or desire of treating upon the subject myself. In fact, my purpose was to gain information from others, for in my two and one-half years of experience as a State sealer I have many times been puzzled and am still often somewhat puzzled as to the proper limit of a State sealer's duty and his jurisdiction. In my present predicament of endeavoring to elucidate the subject of "Functions of a State Sealer," however, no such doubt or ambiguity exists, for here I find myself entirely outside of my jurisdiction.

The functions of the sealer according to the dictionary meaning is the proper activity or employment of his faculties and powers. The faculties are personal, but the powers of the sealer are legal and depend upon the phraseology of the laws giving him authority. For that reason, there is bound to be a slight difference in the powers of a sealer in various States. In the main, however, the authority conferred is the same in every State. The sealer is ordinarily given a general supervision over all the weighing and measuring devices in the State, the authority to test such devices, and often the authority to regulate their use to a greater or smaller degree. The State sealer's authority usually, also, gives him some jurisdiction over the purchase and sale of commodities with reference to the quantity delivered.

The powers and authority are defined in simple terms; their execution is much more complicated; for example, if this phrase is used, "all weighing and measuring devices" it includes besides scales, weights, and measures found in stores the scales used for public weighing, weighing baggage, express, freight in small lots, freight in carload lots and all other scales, weights, and measures whether

used in trade proper, or in manufacture, or even in the household. Furthermore, this phrase includes meters of all sorts, such as water, gas, and electric meters and taximeters. It includes cream test scales, prescription balances, surveyor's chains, and hundreds of similar devices not termed as scales, weights, and measures in the ordinary sense. Therefore, the difficulty arises as to the proper extent of the sealer's exercise of authority.

To solve this difficulty it is necessary in the first place to decide whether he has the legal right to test a certain device. When this is determined upon in the affirmative, he must then use his judgment as a practical man on the question of whether he should exercise this authority.

The question of legal right to test a certain device, I believe, must be decided upon the basis of whether or not the device in question is really used for the determination of quantity or quality. Weights and measures departments are clearly for the purpose of supervising the determination of quantities. Oftentimes we find it difficult to determine whether an instrument is used to measure quantity or test quality, without a technical study into the use of the instrument.

For example, the hydrometer as used by the Vermont maple-sugar dealers is an instrument to determine quantity, although, as I understand it, this instrument is usually used to test quality by determining density. In Vermont the sirup is weighed and then tested by the hydrometer and from these two tests the measure is determined upon which the price is paid. You therefore see that the hydrometer used in this way determines the quantity in a commercial sense, but it was not without a good deal of thought and correspondence that I decided upon assuming jurisdiction over the testing of hydrometers.

Another instrument which presented difficulties along the same line in our department was the cream test scale. This instrument with the pipette and the bottle used in conjunction is usually only a quality instrument, for with these it determines the amount of butter fat in a certain sample of cream and the cream is paid for on the basis of the test of the sample. By law in the State of Vermont bottles and pipettes are under the control of the board of agriculture, so that the only instrument used in making these tests with which we have to deal in any case is the cream test scale. This scale by itself is used to weigh the sample, so we have construed it as a quantity instrument and are testing these scales in the same way we test any ordinary scale, weight, or measure. Similar problems confront the sealer as his work increases. This it is bound to do from year to year if he is an alert and active official. Oftentimes authority specially designated as belonging to some other department aids us in limiting our jurisdiction; for example, in many States meters of various kinds are by special act placed under the jurisdiction of some other department.

After we have determined upon our right to test certain instruments as best we can, the function of the sealer is then to determine whether it is his duty as a public official to further burden his department and expend the people's money by taking up the work of testing the particular devices under consideration. This involves careful

study as to the need of inspection on the one hand and its cost on the other, also a comparison of the need of this work with other work which he must infringe upon if he extends his efforts in the new direction. In practical application we would reverse the order of consideration of the right and advisability of assuming further jurisdiction.

It is particularly incumbent upon the weights and measures official to study into these matters carefully and to use wisdom in his decisions, for we are practically pioneers in our line of work in the United States, and upon the good sense of our actions depends directly the future reputation of honest weights and measures. If we undertake fads and fancies or expend lavishly to correct technical errors, or if, on the other hand, we unnecessarily lend a deaf ear to the crying need for our efforts along a line not previously undertaken, we have carelessly committed a serious offense against honest weights and measures throughout the country and the cause must eventually suffer therefrom.

In a similar manner we must bend every effort to a correct exercise of our authority over the purchase and sale of commodities, which is the other main duty and undoubtedly the highest office of any sealer of weights and measures. Here again it is unquestionably necessary for a sealer to study conditions in order to know how he can most effectually serve the public at large. In my own experience, which I presume is similar to that of other State officials, I soon learned that if the matter of selling and purchasing in accordance with the standards of weight and measure were to be corrected in any effectual way or to any degree it would be necessary to exercise the very best discretion and use every effort to go at the matter in a proper way, for instance, I found that there were certain practices which although absolutely fraudulent had been so thoroughly adopted owing to all lack of control that they had become considered as trade customs by our tradesmen. We found customarily 20 bags of coal sold for a ton and an unweighed bag of grain sold for 100 pounds, butter printed regardless of whether it weighed a pound or not, and beans customarily sold by the liquid quart. In these ways and in several other similar ways there was a systematic defrauding of the consumer.

I do not intend to idealize our Vermont methods, but I simply suggest the method we took to correct these irregularities. We commenced upon our field work and endeavored as soon as possible to put the weighing and measuring apparatus throughout the State in correct condition, so that the merchant had an opportunity to give 16 ounces for a pound, etc. At the same time, we made up different forms of notices relating to the various fraudulent customs and distributed such notices to all possible parties whom they would affect. Further than this, each inspector distributed copies of the laws and of the specifications and regulations and individually called attention to the necessity of doing away with these fraudulent customs. The various notices, etc., were sent to all newspapers and many of them were reprinted in their columns. We, therefore, advertised and explained to the best of our ability throughout every square mile of the State of Vermont and asked particularly for the cooperation of the business men in the matter of proper regulation of buying and selling. After posting the State as thoroughly as

possible we followed up this advertising and educating campaign with as thorough checking up as possible and have prosecuted from time to time since; but in no case have we ever made a prosecution of any party who did not have every opportunity to know what the law meant and to obey the law, and I personally believe that owing to the method employed there has been a speedy and quite universal reform from fraudulent practices in buying and selling and this has been accomplished with very few prosecutions. I further believe and have recently had good evidence that by this method the department has kept itself in good repute with the merchant public as well as the consumers, and if a weights and measures department wishes to exist successfully it is most important to have the cooperation of the people affected by its jurisdiction. It, therefore, seems to me that it is the further duty of a State sealer to so employ his power that the merchant will have every fair advantage and then, of course, to see to it that the merchant takes no illegal advantage.

In a similar manner it is the proper function of a sealer to do all he can to educate the general public to a knowledge of the importance of honest weights and measures and to a respect for that particular law. It is often hard for a person who has studied into a matter thoroughly to realize that the general public have no conception of the meaning of things with which he is familiar. Even after a State law is enacted you will find that the general public, even those who have voted for the enactment of the law, does not understand that the quantity of a commodity for which coinage is exchanged is more vitally important than the coinage itself, and that it does not realize the absolute necessity of the work. The sealer is a special student in this line of work and more or less at the expense of the people gains his information; it is, therefore, his function and his duty to take pains to impart the knowledge which he receives to the general public, and this will, of course, eventually benefit himself and his department. In a similar way, it is a function of a sealer to impress upon the public that a weights and measures department is distinctively a business proposition, and that in behalf of their interests such a department must be freed in every possible way from political influences. Some departments apparently do not suffer particularly in their work because of political juggling, but a weights and measures department is necessarily of both a technical and strictly business nature, and it is the absolute duty of a sealer not on his own account but on behalf of the public to divorce or keep separate his department from all political influences.

A State sealer is not fully or carefully fulfilling his functions if he confines his studies within the limits of his own State, for the relation of the business interests of the tradesmen of different States is so closely related that a sealer must carefully keep in touch with the laws and methods of this work in other States that he may be able to protect his citizens, particularly the merchant public, from the injuries of lack of uniformity. That this is a most necessary part of our functions is evidenced by the presence here of so many of us from all over the United States.

It is futile for me to tell you, many of whom have had more experience than myself, just what the functions of a State sealer are, but

I have done my best to outline in a general way what appear to me to be the functions, and I submit these merely as suggestions for whatever value they may be, and in the hope that further discussion may be taken up so that I can obtain suggestions from others, as was my intention when calling this subject to the attention of the executive committee. However, it does seem to me that it is well for every State sealer to make a personal examination of himself to see if he is using his best effort in his work as head of the department, for under our older weights and measures laws the legislation along this line had been considered and was a farce, under some of these older laws there were officials who were worse than actors in the farce, so that the present official finds himself in a worse predicament than if he were entirely a new proposition. We are further constantly reminded that every earnest and efficient weights and measures official incurs the hatred of a watchful and often organized minority of our tradesmen, whose business had previously been so conducted or is so planned, that the merchants would feel more freedom and less embarrassment without weights and measures laws strictly enforced. This dishonest minority is not without influence, and does not hesitate to attempt to bring weights and measures laws or officials into disrepute by the advertising of any error we may commit, or even by means of the most groundless fabrication of rumors. It is, therefore, unquestionably incumbent upon everyone of us to so conduct his work that his department will be respected and esteemed by his own commonwealth.

TESTING OF CAPACITY MEASURES.

By R. Y. Ferner, *Associate Physicist, Bureau of Standards.*

The method to be used in the testing of capacity measures varies according to the quality of the measure and the purpose for which it is used. Measures of metal, of heavy construction, suitable as the primary standards of an inspection office or as master measures for a manufacturer, should have their volumes determined by weighing the amount of distilled water which they will hold and computing the volume from the known densities of water at the observed temperatures. When such measures are used to standardize other metal measures of less careful construction, or for the testing of the ordinary commercial liquid measure, the test can be best made by emptying ordinary water from the standard measure to the one under test, measuring, by means of a graduated glass cylinder, the amount of water left over after filling the measure under test or the additional amount needed. For testing dry measures, a still less accurate method, but one that is sufficiently accurate in many cases, is by the use of seeds first measured out by the standard measure, the error of the measure under test being ascertained in the same way as with water. Finally measures that are of regular shape may sometimes be measured by an inch rule, or some special gauge, and the volume computed with sufficient accuracy for trade purposes, or the error may be determined by the difference between the measured dimensions and what they should be.

It is proposed in this paper to treat briefly of some of the details and precautions to be observed in each of these methods to obtain different degrees of accuracy up to that of one part in 10,000. The testing of volumetric glassware, such as is used by chemists and druggists, or of the graduated glassware used by a sealer in the testing of capacity measures, is not discussed, as the methods of such testing are fully described in other publications of this bureau.[1]

DEFINITIONS OF UNITS.

It might be well, in the first consideration of this subject, to define the units of capacity measurement common in this country, and to distinguish between the unit of measure and the standard measure itself.

The two fundamental units of liquid and dry measure, respectively, are the gallon and the bushel in the customary system of weights and measures in the United States, while that in the metric system, used for both liquid and dry commodities, is the liter. Both the gallon and bushel, as units, are defined in terms of volume or cubic capacity and are independent of temperature. They may be defined as follows:

A *gallon* is a unit of capacity equivalent to the volume of 231 cubic inches. It is a measure for liquid commodities only.

A *bushel* is a unit of capacity equivalent to the volume of 2,150.42 cubic inches. It is a measure for dry commodities only.

The definition of the liter, on the other hand, does involve a question of temperature. It is defined as follows:

A *liter* is a unit of capacity equivalent to the volume of the mass of 1 kilogram of pure water at the temperature of its maximum density and under the standard atmospheric pressure of 760 mm. At the temperature in question, which is about 4° C., it has been found experimentally that the volume of a liter thus defined is equivalent to 1.000027 cubic decimeters.

DISTINCTION BETWEEN UNITS OF CAPACITY AND CAPACITY MEASURES

It is necessary to decide upon some temperature at which the measures shall be correct, on account of their expansion and contraction with changes of temperature. When the first State standards were made 70 years ago, the temperature decided upon was that of the maximum density of water, 4° C., or 39.2° F. A standard gallon or bushel measure is therefore defined as a measure which has the volume of a gallon or bushel at 4° C. (39.2° F.). This distinction between the gallon or bushel and the standard gallon or bushel measure should be borne in mind carefully in all precision work. The difference will hardly affect the result of ordinary commercial transactions, however, as the expansion of a standard brass measure from the standard temperature of 39.2° to, say, 75.2° F. amounts to only a little over one-tenth of 1 per cent. In other words, the commercial measure tested by means of a standard measure will have no error at ordinary temperatures due to this fact greater than an amount considerably smaller than the degree of accuracy with which

[1] Bureau of Standards Bulletin 4:533, 1908; also Bureau of Standards circulars Nos. 9 and 19.

Fig. 1.—*Set of liquid capacity measures of heavy construction of the type furnished the States by the National Government as standards 70 years ago.*

Fig. 2.—*Set of liquid capacity measures of simple design and construction suitable as State standards or as primary standards for large cities or manufacturers.*

Fig. 3.—*Set of conical liquid capacity measures suitable as secondary standards and especially adapted to inspection work.*

the commercial measure is regularly tested for sealing. (By commercial measure in this paper is meant the ordinary liquid and dry measures used in retail trade, usually made of tinned or enameled ware, galvanized iron or copper, or of wood or fiber.)

TESTS OF PRECISION MEASURES.

The work of the bureau in testing capacity measures consists chiefly in precision measurements of metal measures of substantial construction, and having the top of the measure ground flat and provided with a glass cover plate used to define the filling of the measure. Types of such measures are shown in figures 1 and 2, figure 1 being a photograph of such a set of standards as was sent to the different States 70 years ago, while figure 2 shows a set of measures of a more simple design suitable for State standards. These measures have been required to be adjusted within 1 part in 2,000 in order to receive the seal of the bureau and their capacity is usually certified to 1 part in 5,000 or 10,000.

The method of testing such measures is, in brief, to weigh the measure empty and then to weigh it filled with distilled water, the temperature of which is read. From a table showing what the water in a standard measure of the given size and same material should weigh under the observed conditions, the error of the measure under test can then be ascertained. For the highest precision the atmospheric pressure is read by means of a barometer, and the humidity of the air is determined and corrections are made for the variations caused by changes in these factors. These corrections are not necessary for an accuracy of 1 part in 10,000 except for the special conditions noted later.

DETAILS OF METHOD FOR AN ACCURACY OF 1 PART IN 10,000.

The measure and glass cover should be cleaned and dried. The measure with its cover is then placed on one pan of a suitable equal-arm balance, and with it are placed weights approximately equal to the weight of water held by the measure at the room temperature as found in Tables 1 to 6. This is 1889 grams [1] in the illustrative example shown on page 184, in which the test of a 2-quart measure is shown. The measure and weights are then counterpoised by weights or metal placed in the other pan until the mean position of the pointer of the balance is near the middle of the graduated scale. If the accuracy of the balance is not known, or is such as to make it necessary, scale readings of the vibrations of the pointer are taken as shown in the illustrative weighing. The mean of the averages of the left and right readings, 13 in the example, would be the equilibrium point of the weighing. In actual practice, however, twice this equilibrium point is used—that is, the sum of the averages of the left and right readings, as this factor of 2 cancels out later in dividing one difference of equilibrium points by another. This double equilibrium point for the weighing of the measure empty in the illustrative example is 26. If it is desired to determine the sensitiveness of the

[1] Metric weights are usually used for these tests because of the greater ease of computing results in a decimal system and because of the approximate relation that 1 cubic centimeter of water weighs 1 gram.

balance, a small weight, 0.1 gram in the illustration, is placed on one of the pans with the previous loads remaining on the pans and readings are taken to obtain the new equilibrium point. The difference between this double equilibrium point, 16 in the example, and the one first obtained, 26, when it is divided into the amount of the small weight, 0.1 gram, gives the value of one division of the scale. This value is later used to evaluate the difference between the weighings of the measure empty and when filled.

Test No. —. Date, 5-16-13. Balance, B 3. Observer, R. Y. F.

Pans.		Scale readings.		Equil. points × 2.	Scale difference × 2.
Left.	Right.	Left.	Right.		
Counterpoise.	*2-qt. measure, empty.*		*15*		
	Y 1 kg *10g*				
	500g	*11*	*15*		
	200 *2_1*				
	100 *2_2*				
	50				
	20	*11*	*15*	*26*	
Ditto.	*Ditto + 0.10g.*		*12*		
		5	*10*		
		5	*11*	*16*	*10*
Ditto.	*2-qt. measure, with water at 21.6° C.*		*14*		
		3	*14*		
	+ 0.5g.	*3*	*14*	*17*	*9*

COMPUTATION OF OBSERVED WEIGHT.

		Grams.
Difference of equilibrium	$\frac{0.10}{10} \times 9$ =	*+.09*
Weights in first load	=	*1,889.00*
Weights in last load	=	*−0.50*
Total observed weight of water	=	*1,888.59*

COMPUTATION OF WEIGHT OF WATER IN A CORRECT MEASURE.

Weight of water in *gallon* measure at *22°* C.	=	*3,776.7*
Reduction to *21.6°* C.=*0.4×0.63g*	=	*+.25*
Correction for barometric pressure	=	*+.07*
Total weight under observed conditions of water contained in a standard *gallon* measure	=	*2)3777.0*
Total weight under observed conditions of water contained in a standard *2-quart* measure	=	*1,888.5*
Observed weight of water (from above)	=	*1,888.6*
Correction of *2-quart* measure	=	*+0.1*
	=	*1* part in *19,000*

Therefore the above measure contains *0.5000* gallons at 4° C.

NOTE.—The portions of the above table in roman type represent the form used for these weighings, while the material in italics represents observational data in the particular case.

The measure and weights on the right pan are then removed and the measure is filled with distilled water, the temperature of which is taken just before the filling is completed, 21.6° C in the example. The measure is then placed on the same pan as before, the counterpoise on the other pan not having been disturbed meanwhile, and sufficient weights are added to either pan to bring the pointer near the point of equilibrium of the first part of the weighing, this weight amounting in the illustrative weighing to 0.5 gram while the double equilibrium point is 17. With a balance as sensitive as the one used in the illustration given, it was sufficient, for an accuracy of one part in 10,000, to bring the double equilibrium point within nine divisions of the previous one. With a less sensitive balance, one must determine its possible accuracy and take the precautions necessary to obtain the results desired.

COMPUTATION OF A PRECISION TEST.

COMPUTATION OF THE OBSERVED WEIGHT.

The value in grams of the difference between the double equilibrium point when the measure was empty and when it was filled is found by multiplying it by the value of one division as previously obtained. The result, 0.09 gram in this case, is to be added to the weights in the pan with the measure when empty. The 0.5 gram, on the pan when the measure was filled, is subtracted from the 1,889 grams, since the weight of the water was less than the 1,889 grams by that amount. (The corrections to the weights used should also be included if they are large. Those used in the illustrative example were small, amounting to less than 0.01 gram, and are omitted.) These three quantities give, then, as the observed weight of the water contained in the measure under test, 1,889.6 grams in the example given.

COMPUTATION OF WEIGHT OF WATER IN A CORRECT MEASURE.

To find the error of the measure under test, one finds the weight of water that would be contained in a correct standard measure at the temperature of the test and subtracts it from the observed weight of the water. This may be, for liquid measures, most conveniently computed first for a gallon and the result then divided by the proper factor to give the weight for a measure of the size under test. From Table 1 (p. 194) is taken the value for the whole degree nearest to the temperature observed, 22° in this case, which is 3,776.7 grams. Interpolation to the fraction of a degree is then made, in this case to 21.6° (the correction of the thermometer having been less than 0.1° and therefore neglected) by multiplying 0.4 (the difference between 21.6° and 22°) by the rate of change in weight per degree from 21 to 22°, 0.63 gram in this case, giving +0.25 gram. These rates of change between each degree are shown in the third column of the tables 1 to 4. This interpolation quantity is additive in this case since the weight increases with decrease of temperature.

Since the table of the weight of water in a gallon measure is made out for a standard condition of 760 mm. atmospheric pressure, in

accurate work a correction must be made if the weighing was made at some other pressure. This correction is small, however, amounting to about 0.005 grams per millimeter difference in pressure in the case of a gallon, and would affect the results to one ten-thousandth part only when the pressure is less than 700 mm. and so can be neglected unless the test is being made at such a high altitude that the pressure is lower than this amount. In the latter case a constant correction can be computed and applied to all results with sufficient accuracy. For pressure below 760 mm. this correction is always plus in sign.

In this example, the pressure being about 750 mm, the barometric correction is about 0.07 gram, which added to the interpolation correction of +0.25 gram gives +0.3 gram to be added to 3,776.7 grams, the weight of a gallon at 22°, to give what the water contained in a gallon measure under the observed conditions should weigh.

Corrections for the humiditv of the air may be neglected when working to this accuracy or less.

This quantity, +0.3 gram, being added to 3,776.7 grams gives 3,777.0 grams as the weight in air under the observed conditions of the water contained in a standard gallon measure, and this divided by 2 gives 1,888.5 grams as the corresponding weight of water in a standard 2-quart measure. The difference between this and the observed weight of 1,888.6 grams gives +0.1 gram or cubic centimeter, the correction of the measure under test. This is one part in 19,000, approximately, or the measure under test contained 0.5000 liquid gallon at 4° C.

In case the measure under test is made of some other material than brass, for which the tables used are made out, it might be necessary to apply a correction for the difference in expansion of the two metals from 4° C. to the room temperature. Such a correction would seldom be as great as 0.03 per cent, however.

Such a correction used in case of cubic-foot bottles would be smaller still, as cubic-foot bottles are made to be standard at 62° F. (16.67° C.), instead of 4° C.

PRECAUTIONS IN WEIGHING METHOD.

The most important precautions to be observed in the testing of measures are with regard to the filling of the measure and the temperature of the water. In order that there may be as little change in the temperature of the water during the weighing as possible, it is desirable that the water shall have been in the weighing room for several hours at least before the observations are taken. The filling of the measure is usually done by means of a siphon to avoid the mixture of air with the water. When the filling is nearly completed the cover is placed over part of the top and the temperature is read. If the thermometer used is in error by an amount that will affect the results, its correction should be applied to the reading before the computation is made, a correction of 0.5° C. affecting the results to one part in 12,000. The care taken in reading the temperature should be governed accordingly.

After the reading of the temperature the filling of the measure is completed, the cover being shoved over gradually with a moderate pressure. The last drops of water are usually put in with a pipette, or medicine dropper, and care should be taken that no air bubbles remain under the cover. After the cover is in place no additional pressure should be applied to it with any idea of making a tighter fit, for any such pressure is liable to force out some of the water. Before placing the measure in the balance, any moisture that may be on the outside of the measure or cover should be carefullv wiped off with filter paper or blotters.

The weights used should be of brass or should be known in terms of brass standards. If their errors are large enough to affect the results to the accuracy desired, corrections must be applied to the weighings. It is assumed that the balance used is in proper adjustment.

THE USE OF THE TABLES.

The same method of computation used in the illustrative example—that of computing the weight of water contained in a standard gallon measure under the observed conditions and then dividing by the necessary factor to give the correct weight for the size of measure under test—is applied to dry measures, metric measures, and bottles holding fractions of a cubic foot. Tables 1 to 4 (pp. 194–197) give the necessary weights of water at various temperatures for this purpose, together with the rates of change of weight per degree for interpolation purposes. The weights are also given in pounds avoirdupois in case one wishes to use pound weights instead of metric. Tables 5 and 6 give the weights of water contained in the smaller-sized liquid and dry measures, respectively, for use in determining the weights to be placed on the balance pan with the measure when empty.

TESTING CUBIC-FOOT BOTTLES.

The precision testing of the volume of cubic-foot bottles used as standards in the testing of gas meters is carried out in a manner very similar to that of the test of high-grade capacity measures. It, of course, requires a large balance having a pan capable of holding the bottle. Special methods of filling the bottle have to be used, depending upon the kind of defining lines or surfaces which the bottle may have.

The test of a cubic-foot bottle differs in one respect from that of most other capacity measures in that the bottles are made to be standard at 62° F., instead of 4° C., and the tables of weights of water contained in the bottles are made accordingly. The weights of water contained in a standard cubic-foot bottle made of brass are given in Table 4.

TESTS BY POURING WATER.

The testing of commercial measures by the method of pouring ordinary tap water from the standard measure to the measure under test (or the reverse) involves no great care other than that of accurately

filling the standard measure and ordinary carefulness in emptying it. The standard should, of course, be kept clean, as the presence of dirt or grease in the measure affects the drainage of the measure. If the best accuracy attainable by this method is desired, it is, of course, necessary to use the slicker plate with the standard and, if practicable, on the measure being tested also. Without the slicker plate two observers are apt to have quite different opinions as to the proper stopping point in the filling. For this reason the slicker plate should always be used in any case where a dispute is to be settled. In figure 3 is shown a set of conical measures which are specially suitable for tests made by pouring.

After filling the measure under test from the standard, if the former is under size, the water remaining in the standard is poured into a graduated cylinder or a cone graduate or other graduated glass vessel to determine the error of the measure. This may be graduated in cubic inches, fluid ounces and drams, cubic centimeters, or percentages of the size of measure under test, whichever is most convenient for determining the correction in the units desired. Or in case merely the question of whether the measure is within a certain tolerance is to be settled, the glass may be graduated to this tolerance only. It is desirable that the graduated glass vessel used for the measurement of this error should not be of too great a diameter in proportion to the small amount of water being measured; for this reason the cone graduate has an advantage in that the diameter of the surface of the water varies with the amount measured. It is desirable that cone graduates should be tested before use and they should, preferably, conform to the requirements of the Bureau of Standards specifications for such apparatus, particularly in having the lines extended at least halfway around the measure.

If the measure under test is larger than the standard it would be necessary, after emptying the standard into it, to add the additional water necessary to fill the measure from some glass volumetric apparatus, reading the amount of water in the graduate or cylinder before and after the addition. In this case the use of a cone graduate is less desirable, especially if only a small quantity of water is to be measured, as one loses the advantage of surface diameters proportional to quantity. If necessary to use a cone graduate, the amount of water needed should be estimated as closely as possible and only this amount put into the graduate initially.

The film of water remaining in the standard after emptying is usually negligible if the measure is clean. It varies according to the size and character of the surface of the inside of the measure but seldom amounts to more than 0.15 per cent on a gallon measure and about 0.25 per cent on a quart. For uniform results the measure should be allowed to drain for about 10 seconds and then any hanging drops of water shaken off. The error from this cause may be further eliminated by wetting the inside of the standard and the measure under examination before beginning the test.

The accuracy attainable by this method depends largely on the size of the top of the measure under test if a slicker plate is not used

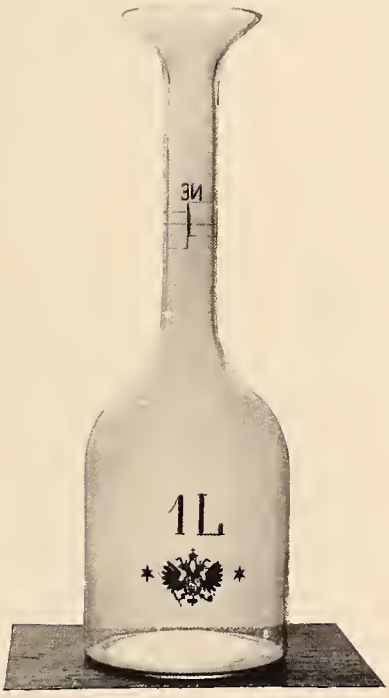


Fig. 4.—*Type of glass bottle specially adapted to testing measures. A line on the neck of the bottle defines the capacity and lines above and below the defining line give the tolerances allowed for new and old measures.*

on it. With a conical-shaped liquid measure having a small top compared with the size of the measure such tests may be made accurately to about one part in 300 or 500 on a gallon measure.

Another method by which measures may be tested by the pouring of water is by the use of a glass bottle having a long, straight neck with a funnel shaped mouth to facilitate filling. This bottle is used as a standard instead of a metal measure and has a line at about the middle of the neck to define the capacity of the bottle. On either side of this defining line may be ruled either tolerance lines or graduations to show the actual amount of the error of the measure under test. Such a bottle is shown in figure 4. In the use of this method the measure under test is filled with water and emptied into this glass standard, the error being read on the graduated neck of the bottle. The advantage of the method is that it is not necessary to measure the error in a separate vessel.

TESTS WITH SEEDS.

In the testing of dry measures with seed much depends upon the kind of seed used and the method of test. In order to determine which of several varieties of seeds gave the best results a series of several hundred tests has been made at the bureau, using measures of different shapes and sizes and allowing the seeds to fall from different heights. In general the best seeds for use in testing measures would be those which fill a measure most uniformly upon repeated fillings and which require the least care in the method of test used as to height of fall, rate of fall, method of striking off the top, and care to avoid shaking down the seeds during the test.

To determine which kind of seed gives the most uniform results upon repeated fillings the following procedure was followed: Using an accurate metal measure of which there could be no question as to its constancy in the experiments, the measure was filled 10 times in succession with each kind of seed for each of the various conditions, and the seed on the top after the measure has overflowed was struck off in the same way each time—that is, with a bevel-edged ruler held somewhat obliquely and struck across the top of the measure. The seed in the measure was then weighed, weighing being used as the most accurate method of determining the actual quantity. That seed of which the deviations of the 10 fillings from the mean of all averaged the least would be the one giving the most uniform results.

Three kinds of seeds were used as representing three distinct types, dried peas, flaxseed, and rape seed.

The average deviations resulting from the 21 series of 10 fillings and weighings each are given in the following table:

Average deviation in 10 fillings.

Seed and measure.	Height of fall.	Deviation.	Seed and measure.	Height of fall.	Deviation.	Seed and measure.	Height of fall.	Deviation.
Flaxseed:	*In.*	*P. ct.*	Dried peas:	*In.*	*P. ct.*	Rapeseed:	*In.*	*P. ct.*
Liquid quart..	5¾	0.15	Liquid quart..	5¾	0.10	Liquid quart..	5¼	0.06
	8¼	.12		8¼	.09		8¼	.06
Dry quart.....	4⅜	.23	Dry quart.....	4⅜	.16	Dry quart.....	4⅜	.08
	5⅞	.16		5⅞	.09		5⅞	.03
	7⅜	.31		7⅜	.16		7⅜	.05
Half peck.....	5¼	.14	Half peck.....	5¼	.07	Half peck.....	5¼	.06
	8¼	.18		8¼	.06		8¼	.11
Mean.....	.....	.18	Mean.....	.....	.10	Mean.....	.....	.06

In this table it is to be noted that the mean of the seven average deviations for flaxseed is 0.18 per cent, for dried peas it is 0.10 per cent, and for rapeseed it is 0.06 per cent. The individual average deviations for different heights of fall and different measures are all comparatively large for flaxseed and all quite small for rapeseed, indicating, then, that so far as uniformity of filling is concerned rapeseed is the best of the three.

As a part of the study of methods of test to be used different heights of fall of the seed were used. So far as the average deviations are concerned there seems to be no decided difference for different distances. The variation in the quantity of seed packed into a measure with different heights of fall is of more importance however, as in accurate tests it might be necessary to carefully adjust the height of the hopper so that the average falling distance to the standard shall be the same as to the measure under test. The results of these changes in the falling distance show that the larger pea seeds become packed more closely together with a greater fall, by an amount which it is necessary to take into account in one's method of use of dried peas, it being approximately one-half of 1 per cent increase in quantity for each inch increase in fall. The increase for flaxseed is considerably smaller, but does not average as low as that of rapeseed of which the change is so small that little if any care of the height of fall need be taken when rapeseed is used, making it practicable for most tests with it to dispense with a hopper altogether if one is careful about other details of the test.

It has been suggested that if the measure were jarred or shaken while the seed was being run into it better results might be obtained by reason of the seed packing down and possibly occupying a more constant amount of space for a given number of seeds than if they were allowed to lie just as they fell. To test this the measures, after some of the fillings and weighings, were jarred on a hard base a definite number of times. The empty space in the measure was then filled again and the seeds struck off as before and another weighing made to determine the additional amount necessary to fill up the

Fig. 5.—*Hopper for use in testing measures with seeds, showing the proper method of striking off the surplus seeds from the top of the measure.*

the measure again. The average of the deviations from the means of these series indicate that without doubt the shaking down of the seeds does not give more uniform results, but quite the contrary.

The more important results of the tests of shaking down the seed are the quantities that had to be added to fill the measures again. These quantities vary greatly with the kind of seed and also greatly though uniformly with the number of jarrings which the measure received. Flaxseed shows the largest quantities, rapeseed the next, and dried peas the least, the amounts varying from 4 to 12 per cent for the largest number of jarrings of the measure.

The size of all the factors resulting from shaking or jarring the seeds is such as to indicate that care should always be taken not to move or shake the standard or measure under test while it is being filled and struck. This large "packing factor," if it might be so called, also indicates very clearly that the striking stick should not be a round stick, as is so often specified, as such a stick must inevitably have considerable packing effect as it is struck across the measure. A beveled-edged ruler or similar striker is therefore to be strongly recommended. It should be of sufficient width, 1½ or 2 inches, or more, to take off the whole of the pile on the top of the measure at one stroke.

The results of these tests of the use of seeds indicate that rapeseed is the best of the three, and probably of any kind of seeds for such use, especially for small measures, though dried peas may often be used with sufficient accuracy for large measures. Both seeds also have the advantage that they keep well for a long time and are not very expensive.

The tests also show that little care need be taken as to the height of fall of the seed, but care should be taken in the handling of the measures to prevent jarring them and in striking off the seeds to prevent packing. With reasonable care this method may be used to an accuracy of from 1 per cent to 0.2 per cent, according to the kind of measure being tested, the use of seeds in testing ice cream and oyster pails being probably the least accurate of the tests.

Briefly, then, the method of test of a dry measure by means of seed is to allow seed to run from a hopper into the standard measure until they overflow the top of the measure, or until there are sufficient seeds to fill the measure when they are leveled down by the striker and leave a small quantity to be struck off; then strike the measure with a beveled-edged striker, returning the extra seeds and those in the hopper to the stock. The seeds in the standard measure are then emptied into the empty hopper and are run into the measure under test. The top of the pile is then spread out carefully with the striker without taking the measure from under the hopper, and any surplus is struck off and collected in a graduated cylinder or other measuring device to determine the exact amount of the excess. For more accurate results they might be weighed if the weight per volume of the seeds is known. If the measure under test happens to be slightly larger than the standard, it will be necessary to add a measured amount of seeds until the measure strikes even.

TESTS BY DIMENSIONAL MEASUREMENTS.

The testing of capacity measures by measurements of the dimensions is usually the least exact of all the methods that have been mentioned. This is on account of the frequent irregularity of the measures, either by bending or warping, or because the measure is not adapted to ready computation of its volume by this method. When the measure is cylindrical or has the shape of the frustum of a cone, the dimensions may be taken with an inch scale with the help sometimes of a pair of compasses or calipers for measuring the inside bottom diameter. If the measure is not truly cylindrical in shape, diameters of both the top and bottom should be measured, as well as the vertical height of the measure. The exact formula for computing the volume having the shape of the frustum of a cone is:

$$V=\frac{\pi H}{3}(R^2+Rr+r^2)$$

where V = volume, H = the internal height of the measure and R and r the semidiameters at the top and bottom of the measure on the inside. Or another form of the same formula, sufficiently accurate, which is somewhat easier to compute, is

$$V=\frac{\pi H}{3}(R^2+R'^2+r^2)$$

where the letters have the same meaning as above except that R' is the mean of R and r. However, unless the larger diameter differs from the smaller by 30 per cent or more, results accurate to 1 per cent may be obtained by using the still simpler formula,

$$V=\pi H\left(\frac{R+r}{2}\right)^2 \text{ or } V=\pi HR'^2$$

the terms having the same meaning as above. This is equivalent to assuming that the frustum of the cone is equal to a cylinder of the same height and having a diameter equal to the mean of the top and bottom diameters.

It is sufficiently accurate in all these formulæ to use π as equal to $\frac{22}{7}$. It is necessary to measure the height of the measure to at least the degree of accuracy desired in the final result; that is, for example, to within 1 per cent of itself if an accuracy of 1 per cent in the volume is demanded. The diameters must be measured to twice that degree of accuracy; that is, in the same case as above, to five-tenths of 1 per cent if an accuracy of 1 per cent in the final volume is required. If the measure is not truly circular at the top or bottom, several diameters in different directions should be measured and the mean taken. The same is true if the height of the measure is not exactly the same at all points. If the bottom of the measure is decidedly curved upward or downward, it would be necessary to compute the volume of that part separately.

When measurements by a scale are sufficiently accurate, it is often convenient to use some of the special gauges made for the purpose of determining whether the dimensions of a measure are correct within certain limits, if one knows that the gauge is correctly graduated. One form of such gauge has scales for different dry units, which when laid across the top of a cylindrical measure will read off what the corresponding height of the measure should be in order that the measure may be correct. The height is then tested by a regular inch scale on the same gauge.

Another gauge has sets of dimensions for the various dry measures, such that having found the diameter of a given measure to be a certain amount there is laid off on an adjacent part of the scale what the corresponding height of a correct measure should be.

A third gauge is made up on a principle similar to that of the slide rule and is graduated so that the sum of the readings of the diameter and height of a cylindrical measure should equal some fixed number if the measure is correct. It is not easy with this rule to determine the actual error of a measure, however, unless the gauge is used with a table showing the amounts of the errors for different combinations of readings.

It is probable that difficulty would be experienced in court in trying to establish evidence based on these gauges, however correct they may be, and it is advisable therefore to use them only for satisfying one's self that a given measure is correct or in error, and to depend upon comparisons with a standard by the medium of water or seeds to establish the evidence.

To summarize, then, the capacity of properly made measures may be determined to 1 part in 10,000 or even better by careful weighings of the water contained in the measure, making such corrections as correspond to that degree of accuracy. The method of weighing the water contained in the measure can also be used to advantage for less accuracy by neglecting certain precautions, omitting certain corrections, and using a more rapid or less sensitive balance.

If one has a standard measure one may use it to test other measures that hold water by pouring from the standard, correctly filled, to the measure under test, or vice versa. This method is capable of an accuracy of about 1 part in 500.

For dry measures that will not hold water, a similar test may be made, using seeds, preferably rapeseed or dried peas, the method giving an accuracy of from 1 part in 100 to 1 in 400. Finally, measures may be tested by special gauges or by determination of their dimensions and a computation made of the volume to an accuracy of from 1 part in 50 to 1 in 200, depending on the size and regularity of the measure.

28670°—14——13

TABLE 1.—*For gallon measures.*

[Table of the weight of air-free distilled water contained in a brass gallon measure standard at 4° C. and of assumed coefficient of cubical expansion of 0.000054 per degree centigrade at each degree of temperature from 1° to 35° C. when weighed in dry air of the same temperature as the water and at a (corrected) barometric pressure of 760 mm. and against brass weights of 8.4 density at 0° C.]

Temperature ° C.	Weight of water in grams.	Rate of change per degree.	Weight of water in avoirdupois pounds.	Temperature ° C.	Weight of water in grams.	Rate of change per degree.	Weight of water in avoirdupois pounds.
		Grams.				*Grams.*	
1	3,780.15	0.37	8.3338			0.54	
2	3,780.52	0.31	8.3346	20	3,777.89	0.58	8.3288
3	3,780.83	0.25	8.3353	21	3,777.31	0.62	8.3275
4	3,781.08	0.19	8.3359	22	3,776.69	0.66	8.3262
5	3,781.27	0.13	8.3363	23	3,776.03	0.70	8.3247
6	3,781.40	0.07	8.3366	24	3,775.33	0.74	8.3232
7	3,781.47	0.02	8.3367	25	3,774.59	0.77	8.3216
8	3,781.49	0.03	8.3368	26	3,773.82	0.81	8,3198
9	3,781.46	0.09	8.3367	27	3,773.01	0.84	8.3181
10	3,781.37	0.14	8.3365	28	3,772.17	0.88	8.3162
11	3,781.23	0.19	8.3362	29	3,771.29	0.92	8.3143
12	3,781.04	0.24	8.3358	30	3,770.37	0.94	8.3122
13	3,780.80	0.29	8.3352	31	3,769.43	0.98	8.3102
14	3,780.51	0.33	8.3346	32	3,768.45	1.01	8.3080
15	3,780.18	0.37	8.3339	33	3,767.44	1.05	8.3058
16	3,779.81	0.42	8.3331	34	3,766.39	1.07	8.3035
17	3,779.39	0.46	8.3321	35	3,765.32	.....	8.3011
18	3,778.93	0.50	8.3311	15⅝(60°F.)	3,779.98	.....	8.3334
19	3,778.43	0.54	8.3300	16⅔(62°F.)	3,779.54		8.3325

TABLE 2.—*For half-bushel measures.*

[Table of the weight of air-free distilled water contained in a brass half-bushel measure standard at 4° C. and of assumed coefficient of cubical expansion of 0.000054 per degree centigrade at each degree of temperature from 1° to 35° C. when weighed in dry air of the same temperature as the water and at a (corrected) barometric pressure of 760 mm. and against brass weights of 8.4 density at 0° C.]

Temperature °C.	Weight of water in grams.	Rate of change per degree.	Weight of water in avoirdupois pounds.	Temperature ° C.	Weight of water in grams.	Rate of change per degree.	Weight of water in avoirdupois pounds.
		Grams.				*Grams.*	
1	17,595.0	1.8	38.790			2.3	
2	17,596.8	1.4	38.794	19	17,587.1	2.6	38.773
3	17,598.2	1.2	38.797	20	17,584.5	2.7	38.767
4	17,599.4	0.9	38.800	21	17,581.8	2.9	38.761
5	17,600.3	0.6	38.802	22	17,578.9	3.0	38.755
6	17,600.9	0.3	38.803	23	17,575.9	3.3	38.748
7	17,601.2	0.1	38.804	24	17,572.6	3.4	38.741
8	17,601.3	0.2	38.804	25	17,569.2	3.6	38.733
9	17,601.1	0.4	38.804	26	17,565.6	3.8	38.725
10	17,600.7	0.6	38.803	27	17,561.8	3.9	38.717
11	17,600.1	0.9	38.801	28	17,557.9	4.1	38.708
12	17,599.2	1.1	38.800	29	17,553.8	4.3	38.699
13	17,598.1	1.4	38.797	30	17,549.5	4.4	38.690
14	17,596.7	1.5	38.794	31	17,545.1	4.5	38.680
15	17,595.2	1.7	38.791	32	17,540.6	4.7	38.670
16	17,593.5	2.0	38.787	33	17,535.9	4.9	38.660
17	17,591.5	2.1	38.783	34	17,531.0	5.0	38.649
18	17,589.4	2.3	38.778	35	17,526.0		38.638

TABLE 3.—*For liter measures.*

[Table of the weight of air-free distilled water contained in a brass liter measure standard at 4° C. and of assumed coefficient of cubical expansion of 0.000054 per degree centigrade at each degree of temperature from 1° to 35° C. when weighed in dry air of the same temperature as the water and at a (corrected) barometric pressure of 760 mm. and against brass weights of 8.4 density at 0° C.]

Temperature ° C.	Weight of water in grams.	Rate of change per degree.	Weight of water in avoirdupois pounds.	Temperature ° C.	Weight of water in grams.	Rate of change per degree.	Weight of water in avoirdupois pounds.
		Grams.				*Grams.*	
1.....	998.63		2.2016			0.13	
		0.10					
2.....	998.73		2.2018	19.....	998.18	0.15	2.2006
		0.08					
3.....	998.81		2.2020	20.....	998.03	0.15	2.2003
		0.07					
4.....	998.88		2.2021	21.....	997.88	0.16	2.1999
		0.05					
5.....	998.93		2.2023	22.....	997.72	0.18	2.1996
		0.03					
6.....	998.96		2.2023	23.....	997.54	0.18	2.1992
		0.02					
7.....	998.98		2.2024	24.....	997.36	0.20	2.1988
		0.01					
8.....	998.99		2.2024	25.....	997.16	0.20	2.1984
		0.01					
9.....	998.98		2.2024	26.....	996.96	0.22	2.1979
		0.03					
10.....	998.95		2.2023	27.....	996.74	0.22	2.1974
		0.03					
11.....	998.92		2.2022	28.....	996.52	0.23	2.1970
		0.06					
12.....	998.86		2.2021	29.....	996.29	0.24	2.1964
		0.06					
13.....	998.80		2.2020	30.....	996.05	0.25	2.1959
		0.07					
14.....	998.73		2.2018	31.....	995.80	0.26	2.1954
		0.09					
15.....	998.64		2.2016	32.....	995.54	0.27	2.1948
		0.10					
16.....	998.54		2.2014	33.....	995.27	0.27	2.1942
		0.11					
17.....	998.43		2.2012	34.....	995.00	0.29	2.1936
		0.12					
18.....	998.31		2.2009	35.....	994.71		2.1930
		0.13					

TABLE 4.—*For cubic-foot bottles.*

[Table of the weight of air-free distilled water contained in a brass cubic-foot bottle standard at 16.67° C. (62° F.) and of assumed coefficient of cubical expansion of 0.000054 per degree centigrade at each degree of temperature from 15° to 35° C. when weighed in dry air of the same temperature as the water and at a (corrected) barometric pressure of 760 mm. and against brass weights of 8.4 density at 0° C.]

Temperature ° C.	Weight of water in grams.	Rate of change per degree.	Weight of water in avoirdupois pounds.	Temperature ° C.	Weight of water in grams.	Rate of change per degree.	Weight of water in avoirdupois pounds.
		Grams.				*Grams.*	
15	28,258.4	2.8	62.300			6.0	
16	28,255.6	3.1	62.293	27	28,204.8	6.3	62.181
17	28,252.5	3.4	62.286	28	28,198.5	6.6	62.167
18	28,249.1	3.8	62.279	29	28,191.9	6.8	62.153
19	28,245.3	4.0	62.270	30	28,185.1	7.1	62.137
20	28,241.3	4.4	62.261	31	28,178.0	7.3	62.122
21	28,236.9	4.6	62.252	32	28,170.7	7.6	62.106
22	28,232.3	5.0	62.242	33	28,163.1	7.8	62.089
23	28,227.3	5.2	62.231	34	28,155.3	8.0	62.072
24	28,222.1	5.5	62.219	35	28,147.3	----------	62.054
25	28,216.6	5.8	62.207	15⅔(60°F.)	28,256.9	----------	62.296
26	28,210.8	6.0	62.194	16⅔(62°F.)	28,253.6		62.288

TABLE 5.—*For liquid measures.*

[Weight of air-free distilled water contained in brass liquid measures standard at 4° C. and of assumed coefficient of cubical expansion of 0.000054 per degree centigrade at each degree of temperature from 1° to 35° C. when weighed in dry air of the same temperature as the water and at a (corrected) barometric pressure of 760 mm. and against brass weights of 8.4 density at 0° C.]

Temperature ° C.	Two quarts.	One quart.	One pint.	Half pint.	One gill.
	Grams.	*Grams.*	*Grams.*	*Grams.*	*Grams.*
1	1,890.07	945.04	472.52	236.26	118.13
2	1,890.26	945.13	472.57	236.28	118.14
3	1,890.42	945.21	472.60	236.30	118.15
4	1,890.54	945.27	472.64	236.32	118.16
5	1,890.64	945.32	472.66	236.33	118.16
6	1,890.70	945.35	472.68	236.34	118.17
7	1,890.74	945.37	472.68	236.34	118.17
8	1,890.75	945.37	472.69	236.34	118.17
9	1,890.73	945.36	472.68	236.34	118.17
10	1,890.68	945.34	472.67	236.34	118.17
11	1,890.61	945.31	472.65	236.33	118.16
12	1,890.52	945.26	472.63	236.31	118.16
13	1,890.40	945.20	472.60	236.30	118.15
14	1,890.26	945.13	472.56	236.28	118.14
15	1,890.09	945.05	472.52	236.26	118.13
16	1,889.90	944.95	472.48	236.24	118.12
17	1,889.70	944.85	472.42	236.21	118.11
18	1,889.47	944.73	472.37	236.18	118.09
19	1,889.22	944.61	472.30	236.15	118.08
20	1,888.95	944.47	472.24	236.12	118.06
21	1,888.65	944.33	472.16	236.08	118.04
22	1,888.34	944.17	472.09	236.04	118.02
23	1,888.01	944.01	472.00	236.00	118.00
24	1,887.66	943.83	471.92	235.96	117.98
25	1,887.30	943.65	471.82	235.91	117.96
26	1,886.91	943.45	471.73	235.86	117.93
27	1,886.50	943.25	471.63	235.81	117.91
28	1,886.08	943.04	471.52	235.76	117.88
29	1,885.64	942.82	471.41	235.71	117.85
30	1,885.19	942.59	471.30	235.65	117.82
31	1,884.71	942.36	471.18	235.59	117.79
32	1,884.22	842.11	471.06	235.53	117.76
33	1,883.72	941.86	470.93	235.46	117.73
34	1,883.20	941.60	470.80	235.40	117.70
35	1,882.66	941.33	470.67	235.33	117.67
15⅝ (60° F.)	1,889.99	945.00	472.50	236.25	118.12
16⅔ (62° F.)	1,889.77	944.88	472.44	236.22	118.11

TABLE 6.—*For dry measures.*

[Weight of air-free distilled water contained in brass dry measures standard at 4° C. and of assumed coefficient of cubical expansion of 0.000054 per degree centigrade at each degree of temperature from 1° to 35° C. when weighed in dry air of the same temperature as the water and at a (corrected) barometric pressure of 760 mm. and against brass weights of 8.4 density at 0° C.]

Temperature °C.	One peck.	Half peck.	Quarter peck.	One quart.	One pint.	Half pint.
	Grams.	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*
1	8,797.5	4,398.8	2,199.4	1,099.69	549.84	274.92
2	8,798.4	4,399.2	2,199.6	1,099.80	549.90	274.95
3	8,799.1	4,399.6	2,199.8	1,099.89	549.94	274.97
4	8,799.7	4,399.8	2,199.9	1,099.96	549.98	274.99
5	8,800.1	4,400.1	2,200.0	1,100.02	550.01	275.00
6	8,800.4	4,400.2	2,200.1	1,100.05	550.03	275.01
7	8,800.6	4,400.3	2,200.2	1,100.08	550.04	275.02
8	8,800.6	4,400.3	2,200.2	1,100.08	550.04	275.02
9	8,800.6	4,400.3	2,200.1	1,100.07	550.04	275.02
10	8,800.4	4,400.2	2,200.1	1,100.04	550.02	275.01
11	8,800.0	4,400.0	2,200.0	1,100.00	550.00	275.00
12	8,799.6	4,399.8	2,199.9	1,099.95	549.97	274.99
13	8,799.0	4,399.5	2,199.8	1,099.88	549.94	274.97
14	8,798.4	4,399.2	2,199.6	1,099.80	549.90	274.95
15	8,797.6	4,398.8	2,199.4	1,099.70	549.85	274.92
16	8,796.7	4,398.4	2,199.2	1,099.59	549.80	274.90
17	8,795.8	4,397.9	2,198.9	1,099.47	549.73	274.87
18	8,794.7	4,397.3	2,198.7	1,099.34	549.67	274.83
19	8,793.5	4,396.8	2,198.4	1,099.19	549.59	274.80
20	8,792.3	4,396.1	2,198.1	1,099.03	549.52	274.76
21	8,790.9	4,395.5	2,197.7	1,098.86	549.43	274.72
22	8,789.5	4,394.7	2,197.4	1,098.68	549.34	274.67
23	8,787.9	4,394.0	2,197.0	1,098.49	549.24	274.62
24	8,786.3	4,393.2	2,196.6	1,098.29	549.14	274.57
25	8,784.6	4,392.3	2,196.1	1,098.07	549.04	274.52
26	8,782.8	4,391.4	2,195.7	1,097.85	548.92	274.46
27	8,780.9	4,390.5	2,195.2	1,097.61	548.81	274.40
28	8,778.9	4,389.5	2,194.7	1,097.37	548.68	274.34
29	8,776.9	4,388.4	2,194.2	1,097.11	548.56	274.28
30	8,774.8	4,387.4	2,193.7	1,096.85	548.42	274.21
31	8,772.6	4,386.3	2,193.1	1,096.57	548.28	274.14
32	8,770.3	4,385.1	2,192.6	1,096.29	548.14	274.07
33	8,767.9	4,384.0	2,192.0	1,095.99	548.00	274.00
34	8,765.5	4,382.8	2,191.4	1,095.69	547.84	273.92
35	8,763.0	4,381.5	2,190.8	1,095.38	547.69	273.84

DISCUSSION.

Mr. WOOLLEY. Mr. Chairman, I would ask Mr. Ferner if from his investigations and examination of seeds best suited for the proper testing of dry measures, he feels that rape seed is the proper seed for practical sealers to use in measuring.

Mr. FERNER. I see no reason why it is not.

Mr. WOOLLEY. More so than others that you have mentioned?

Mr. FERNER. I think so; very much better than flaxseed. It might be that peas or beans would be nearly as good, especially advisable, perhaps, for larger measures. The rape seed is especially adaptable to the small measures, where you want to get a little better accuracy.

Mr. WOOLLEY. The reason I ask this question is that in Boston we have many inquiries from the different sealers, and I know they all

use different seeds. I thought perhaps it would be well at this time to ask that question, so that possibly we might use the same seed.

Mr. FERNER. The rape seed is very nearly round; it packs more uniformly in filling, gives less trouble in shaking the measure, and does not have the troubles found with other seeds.

Mr. WOOLLEY. Thank you, sir.

Mr. CLARK. Mr. Chairman, may I ask the gentleman if he experimented with split peas?

Mr. FERNER. No, I did not; I avoided that because I feared that they might have the same trouble that we have in the case of flaxseed; that is, having flat surfaces, there would be that slipping and packing effect. They would be more in the class of flaxseed, but probably not as bad as flaxseed.

Mr. CLARK. How does the cost of rape seed compare with that of peas?

Mr. FERNER. The cost of the seed is about the same as that of peas, I should say; possibly a little cheaper. It could be used as well; except, of course, with a bushel basket where you have woven parts, where it could get between the parts.

REPORT OF THE SPECIAL COMMITTEE ON RESOLUTIONS.

Mr. SMITH. Mr. Chairman, I would like at this time to present the report of the special committee on resolutions.

On behalf of the committee I wish to thank Mr. Thompson for the very valuable aid he has given us in a legal manner. This is a resolution which the conference directed to be framed regarding uniformity in the sale of dry commodities.

EIGHTH ANNUAL CONFERENCE ON WEIGHTS AND MEASURES,
Washington, D. C., May 16, 1913.

Whereas, a review of the laws and statutes of the different States reveals a lack of uniformity in respect to the sale of commodities by dry measure and bushel weights, such laws or statutes specifying various legal weights for the dry measures of different volumes, according to the conditions which seem to prevail in the different localities; and

Whereas, there appears to be a growing desire and necessity for the abolition of what might be called a dual system in that respect; and

Whereas, the abolition of such conditions would be beneficial to both the buyer and the seller, and would have the result of establishing a uniform basis of trade in such commodities in all of the States of the Union; now, therefore, be it

Resolved by the Eighth Annual Conference on Weights and Measures of the United States in conference assembled in Washington, D. C., May 14 to 17, 1913, inclusive, That this conference recommend to the Congress of the United States and to the individual States the abolition of such a practice as now prevails, by sending a copy of this resolution to the President of the United States, the President of the United States Senate, the Speaker of the House of Representatives, and the governor of each of the States, specifically asking that all laws specifying legal bushel weights or legal weights for other dry measures of all volumes be repealed and such laws be enacted as will insure the sale of all commodities usually so sold on a basis of weight or numerical count only.

The ACTING CHAIRMAN. You have heard the report of the committee. What will you do with it?

Mr. KELLEY. Mr. Chairman, I move that the report be accepted and the recommendation adopted.

(The motion was seconded.)

Mr. WALLENMEYER. Mr. Chairman, I would move as an amendment that this be sent to the Senators and Congressmen. It is very important that they should know what we are doing.

(The motion was seconded and the amendment was agreed to.)

The ACTING CHAIRMAN. The question is on the report as amended.

(The question was taken, and the report was adopted.)

Mr. SCHWARTZ. Mr. Chairman, I think it would be a good idea to have copies given to each member of this conference to take home and give to the newspapers, so as to get them before the public; also for any man who can reach a Congressman or Senator to take up the matter personally.

Mr. FINE. Mr. Chairman, I think this is a good idea. Perhaps it will be a difficult matter for the secretary of this conference to give us copies to-day or to-morrow, but I believe that some method ought to be adopted by this conference to send a copy to each one of the delegates who are here as soon as possible. I would make that as a motion—that this conference should send a copy to each one of the delegates—if it is in order to do so; if not, I will make it as a suggestion.

Mr. CLARK. Mr. Chairman, it seems to me all that is necessary is to have each State delegate supplied with one copy; then when he gets back he can have his department mail one to every sealer. I intend to do that when I get back from Washington. A copy of this will be in the hands of every sealer in the State of Massachusetts within one week, with the request that they notify their papers and the officials of the cities and towns.

Mr. KEACH. May I inquire if there is anything to finance this at all? Now, this body that we have here has no treasurer. If we are going into this in detail for the whole United States, it is going to cost some money, and I think we ought to organize into a corporation or society, and each one of us have dues to pay—every man that belongs to the conference.

The SECRETARY. A committee has been appointed, Mr. Keach, to draw up a constitution and by-laws. They will report later and they intend to provide for that.

Mr. KEACH. Would it not be a good idea, then, to make an amendment, so that we may put the onus upon the Government bureau here, and they then can get it franked by having it made a Government document, and then the Congressmen can frank it to all their constituents?

The SECRETARY. Just what is it that you want? Do you want to know whether we can have that resolution printed and sent out?

Mr. KEACH. Yes; and who is going to pay for it.

The SECRETARY. I doubt very much if we could do it as a separate document. We could have it incorporated in our conference report, but I doubt very much if we could do the other.

The ACTING CHAIRMAN. Has this organization any funds?

The SECRETARY. No funds at all.

Mr. FINE. May I ask when the minutes will be printed?

The SECRETARY. Not for three months at least.

Mr. FINE. Can we not get permission from some Congressman for leave to print, and have this printed and make it a document of the Government, so that it can be franked to all Congressmen all over the country?

The SECRETARY. I do not see any chance of that at the present time. It may be done later.

Mr. RADCLIFFE. Why not give this to the papers, and let each man take the paper in the morning and cut it out of the paper? Use the newspapers; that is the way to do business.

Mr. SMITH. Mr. Chairman, I have another resolution which I would like to present as a part of the work of the committee.

It was brought to our attention that a certain part of the Underwood tariff bill contained the duties upon dry commodities based upon bushel weights, and in view of that fact the committee wished me to offer this resolution:

Whereas the present tariff bill, known as the Underwood bill, now pending before Congress, in Schedule G, specifies the duties on certain commodities of State and interstate and international trade that are usually sold on the bushel-weight basis; and

Whereas this Eighth Annual Conference on the Weights and Measures of the United States has this 16th day of May, 1913, passed a resolution directed to the Federal Government and to the government of the different States of the Union, asking that the sale of such commodities be by weight or numerical count; now, therefore, be it

Resolved, That this conference recommend to the President of the United States and to the Congress of the United States now assembled that all reference in such schedule in the Underwood bill to the laying of duties on commodities usually sold on a legal bushel-weight basis be made to apply to such commodities on the basis of weight only, and all reference to specified weights per bushel of the different commodities be eliminated.

A DELEGATE. Mr. Chairman, I move the adoption of this resolution.

Mr. KEACH. I second the motion; and as it is now open for discussion, I should like to ask whether the gentleman has referred to the other part of it, which in that same clause of the Underwood bill says that a foreign country shall not have the benefit of the tolerance, if any, the allowance, if any, or the demurrage fee, if any, where it goes through the customhouse. It is only people in interstate traffic; it shuts out Canada, England, and all other countries. Therefore, I do not know whether that would apply or not. It would not have any effect, I think, because they would not get any tolerance on anything, if there was to be a tolerance. If we passed anything for our own people, no foreign country would get it under the Underwood bill.

The ACTING CHAIRMAN. Is there any other discussion of this?

Mr. GOODWIN. Mr. Chairman, I think we should recognize the legal ability of this gentleman from New York regarding this matter. It seems to me that if it will conflict with foreign commerce we should eliminate that clause. This is to regulate first interstate commerce between ourselves, as I understand it; and I question whether we have the right to go further. Therefore, I think it would be well to eliminate foreign nations from this resolution.

Mr. KEACH. There were two words in that resolution that I think ought to be left out. If you will read that resolution over again, I will criticize it after that.

Mr. SMITH (reading):

Whereas the present tariff bill, known as the Underwood bill, now pending before Congress, in Schedule G, specifies duties on certain commodities of the State and interstate and international trade that are usually sold on the bushel-weight basis——

Mr. KEACH. I would strike out the word "international." And then there are two other words after you get along a little farther, I think.

Mr. SMITH (continuing to read):

And whereas this Eighth Annual Conference on the Weights and Measures of the United States has this 16th day of May, 1913, passed a resolution directed to the Federal Government and to the government of the different States of the Union, asking that the sale of such commodities be by weight or numerical count; now, therefore, be it resolved that this conference recommend to the President of the United States and to the Congress of the United States now assembled that all reference in such schedule in the Underwood bill to the laying of duties on commodities usually sold on a legal bushel-weight basis be made to apply to such commodities on the basis of weight only, and all reference to specified weights per bushel of the different commodities be eliminated.

Mr. KEACH. If you strike out the word "international" then I have no objection.

Mr. THOMPSON. Mr. Chairman, may I be permitted to offer the suggestion that in the first part of the resolution offered here, specifying the commodities that enter into State, interstate, or international trade, the specification was merely to define the commodity, coupling that with the idea that those were the commodities usually sold on the bushel-weight basis; not for the purpose of saying that we were to interfere in any way with any interstate trade? We do not care what any other nation does in relation to this Underwood bill, if they derive no benefit from this portion of Schedule G of this bill.

Mr. KEACH. But in regard to the word "international"—if the Congress of the United States passed a law that attempted to legislate for Canada, you all know that would be extraterritorial and nonobligant. The State of Massachusetts can not pass a law for the District of Columbia. Neither can my State of New York pass a law that reaches over into Massachusetts to govern them civilly, commercially, criminally, or in any other manner. It is extraterritorial and nonobligant. Each one stands on his own footing, and the Government above all; and this being under the Constitution of the United States, ingrafted from the original Articles of Confederation, which were adopted by more than two-thirds of all States, of course it can not be changed unless we change the United States Constitution, which, of course, we are not going to do. I move to strike out the word "international"—not "interstate," of course, but "international."

Mr. SMITH. I would like to call the attention of the gentleman from New York again to that particular paragraph. It specifies duties on certain commodities of State, interstate, and international trade that are usually sold on a bushel weight basis. As I understand it, the "international" simply defines what commodities are sold, and the idea of the resolution does not in any way affect international trade.

Mr. KEACH. No, no; it is ambiguous, and would be so construed by cunning lawyers and might make you a lot of trouble. We do not

care what England, France, Germany, or other countries do as to weights and measures or anything else; but when they come here to our land they must obey our laws, of course. Now, make it definite enough for the United States only; leave out the word "international" entirely. It occurs twice, I think, in your resolution.

The ACTING CHAIRMAN. Do you care to accept that suggestion?

Mr. SMITH. Was the motion made?

The ACTING CHAIRMAN. Yes; you made the original motion, and it was seconded. An amendment was proposed, but this has not been seconded.

A DELEGATE. I will second it.

The question was taken on the amendment, and the motion to amend was lost.

The ACTING CHAIRMAN. Now the original motion is before you.

The question was taken and the resolution was adopted.

ELECTION OF OFFICERS.

Mr. SCHWARTZ. Mr. President, your committee on nominations beg leave to report at this time that after going carefully over this question they recommend the following nominations for officers of this conference for the ensuing year: For president, Dr. S. W. Stratton, of the bureau; for vice president, Mr. William L. Waldron, of New Jersey; for secretary, Mr. Louis A. Fischer, of the bureau; for treasurer, Mr. Charles C. Neale, of Minnesota.

As the resolution passed this morning increased the number on the executive committee by three, the following nominations are reported for that committee, in addition to the officers already named, who are ex-officio members of that committee: Mr. H. H. Henry, of Verment; Mr. J. T. Willett, of Indiana; Mr. O. Evans Mikesell, of Pennsylvania; Mr. Fred C. Downing, of Wisconsin; Mr. A. W. Rinehart, of Washington; Mr. John L. Walsh, of New York City; Mr. Fred C. Albrecht, of Ohio; Mr. W. F. Hand, of Mississippi.

We have endeavored to cover the entire United States as well as we could and to get as good a representation from the different sections as possible.

Mr. MARONEY. Mr. Secretary, I move you, sir, that our presiding officer cast the unanimous ballot of this convention for the officers as presented by the nominating committee.

The motion was seconded and agreed to.

SEALS AND THE METHODS OF SEALING.

By C. C. NEALE, *Commissioner of Weights and Measures, State of Minnesota.*

Gentlemen, before I proceed to the subject in hand, let me tell you that I appreciate your action in creating the new office of treasurer for me and inform you that I am now officially ready to receive the "mazuma"; but, let me also inform you that I am already paying a premium on a $10,000 bond, and I am somewhat fearful of paying any more premium.

The matter of seals and the different forms and methods of sealing is perhaps one of the most perplexing things in the whole subject of weights and measures for the sealer to handle. In the exhibit here, gathered from 40 cities, counties, and States (there are 41 cards, but 2 are duplicates), we find that 9 out of the 40 use the practice of applying a metal seal or tag only; 19 use either a metal seal or a sticker of some kind; and 12 use labels only. Now, I presume that if there is any class of men engaged in any kind of business who are jealous of their individual efforts, it is the people in the weights and measures business in all that pertains to their work of testing and marking—that is, sealing—and of the different types of seals displayed here this afternoon it would not be easy to change many of them, because the legal status of many of them, as far as design is concerned, is decided by ordinance, State law, or whatever the law may be. Hence I do not think it is the object of this particular discussion to try to reconcile or make uniform the different methods of sealing.

The seal as applied to weighing and measuring equipment has a peculiar significance. It is the official mark, of which the sealer himself has the right to be proud. It is the indication to the public, who are the ultimate people to be benefited, that the sealer has done his duty, and to the honest merchant is a safeguard in his business.

I might say that of the many seals that we received it was rather difficult to formulate something which would tell the story in a small compass. It was done in this way, first, we considered the scales—what is usually done to the scales by the inspector. He tests them and finds them correct, and so marks them, and we have a class of correct scales. He finds them incorrect, in which case there are two things that happen. He marks them suitably, as rejected for repairs—that is, scales that can be repaired or at least possibly can be repaired—or he puts a condemnation tag on scales that can not be repaired. Personally, while Minnesota has a condemnation tag, I do not see much use for it for this reason: Scales which are not suitable for commercial purposes should be destroyed, gotten out of the way, and not given even the compliment of a condemnation tag. However, I realize that in the case of a wagon scale or other large scale it would be rather a hard task to take an ax and break it up. Hence perhaps the need of some mark for condemnation purposes.

I will now take up some of the peculiarities of these types of sealing devices and demonstrate from where some of our troubles in Minnesota have come. Personally I am in favor of a distinctive metal seal largely because of its conspicuousness and, also, perhaps, because it partakes more of the character of official work than the sticker or label alone. However, we have found in the practical use of these base-metal seals that with many types of scales it is practically impossible to keep a seal of this character [indicating] on the scale. Boys and meddlesome people will twist them off and leave the scale without any tangible mark that the work was done. I admit that the label is much cheaper and, I might say for our family benefit here, that the best we can buy these seals for is $6.75 per thousand on competitive bid. So, while I personally am in favor of some distinctive mark of this sort, it would seem that it should be affixed more firmly than we

have thus far done by means of the flimsy wire that does not seem to serve the whole purpose. This has reference to the ordinary sealing wire attached to a seal slug.

I observe one type here which has a means of fastening the seal which seems to be very secure. It is used for ice scales. I appreciate that on a beautiful $200 computing scale it would not look well perhaps to have a big cumbersome thing of that kind. But I find over here, in the State of New York exhibit, something automatically locking, designed to fix and hold the seal to the scale, and which is neat and secure, but is possibly too expensive for general use. Remember now, I am giving no advice; because, as I said before, many of you weights and measures officials who use these different forms of seals have them determined for you by your own laws, and have reason to be satisfied with your own methods as long as good results are obtained. I say, regarding the expense, that undoubtedly this kind of a seal, that is the metal tag, runs into considerable money; and in our own case, having provided the means of sealing for possibly 95,000 scales, it means about $650 invested in that alone.

There is one more objection, however, to the loose, hanging seal which I would like particularly to point out. That is the impossibility of fixing that type of seal to many types of scales. Our drug stores ordinarily are equipped with the even arm delicate balance encased in a case or shield, and there is nothing to which to attach the seal. This is, alas, true of shielded butter scales, personal street scales, and scales of many types. You find also that on the ice scales, unless they are affixed by some heavy means, the light metal seals will not stay on. Hence, I believe it will have to resolve itself, for the ice scales and the other scales that will not bear a seal, to either the label or the sealing die.

Referring to the sealing die: I will ask you for just a moment to look at this piece of wood [indicating] made to represent a yard stick. Here is a type, showing the name of the man who approved it, and the date thereof, on various places, used for the purpose of sealing linear measures. I have learned something about linear measures since attending this convention, and I found among the manufacturers' exhibits something that I did not know existed. However, casting about for some suitable tack to take care of the thousand measures in our State, we finally fastened upon this No. 6 gilt tack, which is not very much used at the present time for upholstery work. Thus far we have had to seal our measures with the official mark of our inspector, as many others perhaps have done, and use the die to show the insignia of sealing. We have found that very unsatisfactory. In hard wood it mashes up the wood in continual sealing, and you have no chance of making additions to your sealing mark. But just before coming away, inasmuch as our own State has all through its work followed the scheme of a triangle, we had designed a little thing of that kind [indicating]. Now, this is not the tack, remember; it is the sealing mark. This "5" indicates the fifth month—"Minnesota, 1913." Now, it happens that great minds run in the same channels, and when I met Mr. Downing on the train coming from Chicago, on our way to this convention, I discovered

that Wisconsin had at the same time designed a circular mark for the same purpose. In our big stores in Minneapolis and St. Paul the merchants are very proud of something to show the public that that work has been done, and that their measures have an official appearance. They were not satisfied—and, indeed, neither were we satisfied—with this rather obscure mark—that is, the steel die mark—even if we ignore the chewing-up operation at the counters; and I believe that some distinctive mark that the sealers could date from year to year, if the seal is to bear a date, would be a very great improvement over the use of the die. There are, as you know, some very beautiful counters—plate-glass, metal-bound, etc.—and the die leaves a very unsatisfactory mark; and I believe that along that line the merchant in general, if he be the right kind of merchant, is practically as proud of the weights and measures officials' mark of correctness as the weights and measures official is himself.

This card indicates the Minnesota method of sealing used for basket manufactories, the manufacturers making baskets under State specifications, and having a serial number. You might think that quite unnecessary, but remember in the State of Minnesota we are working under a rather stiff system, which means that every time that a light, fragile container is handled as a bushel—and we were still working under bushels until April 26—it would have to be tried out, calibrated and marked at a minimum price of 2½ cents apiece in blocks of 50. However, the commission took the bull by the horns, so to speak, and said, "Here, we will have our manufacturers who make those baskets for bushel use in Minnesota have the capacity shown, have their name printed thereon, and have samples on file in the department, which the manufacturers must duplicate in their factory output, as per their agreement with the State Department of Weights and Measures."

This [indicating] illustrates the method of marking ice-cream containers "Filled to the top." Perhaps some weights and measures officials will say that the ordinary paper ice-cream container should not be a measure. Now, the way I figure that out is this: I go into your store and say, "I want a quart of ice cream." In order to keep wholly within the law, you have got to go through this operation: Take your sealed measure, fill it full of ice cream, and then dump it out of that sealed measure into the paper carrier. The operation has been tedious; it has taken time, not to speak of the insanitary intermediate measure. So we figured out a plan of having marked containers, with the factory behind them, contracting with the State that they would make them as per the submitted sample. It means, then, that the ice-cream container becomes a measure in itself; it expedites the work of the merchant, and you get your commodity immediately in a nice, clean container. I took that matter up with Mr. Fischer; and, in fact, to show you how anxious we all are in the supervisory work of weights and measures to reach for something that we have not got ourselves, certain manufacturers of pails had marked on them "Approved by the United States Bureau of Standards." So I said, "Fortunate indeed; if that is approved by the bureau it is good enough for Minnesota." I wrote, however, to Mr.

Fischer for a verification of the statement. He wrote back and said that officially it had no status. It caused quite a bit of commotion among our eight or ten big distributors in the State of Minnesota, who had believed that the Bureau of Standards was behind the accuracy of the containers as the label stated. However, they were very glad of the opportunity of raising that carrier to the status of a legal measure, and the manufacturers are, of course, complying with their request, because the manufacturer has to comply with the request of the distributor.

Now, I do not suppose that it would be policy to try to describe the different cards here in detail, and I could not do so. A word will suffice as to the general scheme. Measures are divided into dry, liquid, and linear; sealed, rejected—that is, if they can be repaired—or confiscated. The same things, of course, obtain with weights; they are sealed, rejected for repairs, or confiscated. I would say, furthermore, for the gentlemen who have helped me to make this exhibit, that there are certain blanks appearing here, and on the back of these cards are the original letters from the gentlemen who have so kindly helped us. Now, the blanks that appear mean this—that we could not clearly understand the particular means of applying the different seals in their respective places; and it would be appreciated—although I do not suppose you will have time—if any of you gentlemen see any errors here, if you would call attention to them.

DISCUSSION.

Mr. WULFSON. Where is that red card from?

Mr. NEALE. That is conspicuous, I admit. That is from the State of Kansas, furnished by our good friend, Mr. Stimpson, who is not here.

Here is another matter. This is our means of taking care of weights that a sealer can not immediately correct. In that event, if our man has his heavy equipment with him, or if it is not convenient to get to a local place where they can be prepared for proper adjustment, those weights that are faulty are sealed up in an envelope, as shown on this card, which speaks for itself; and it is up to the merchant then to get them adjusted.

Mr. FINE. Take that expensive seal there, which you said cost about $750 to purchase; how is the city going to buy them?

Mr. NEALE. I appreciate that difficulty, sir. The label, of course, does serve the purpose; but I have heard many sealers experienced in the work claim that the label does not stay on well; and in my own experience, the merchants in our State have been trained to look for these marks, and they seem to take pride in seeing a loosely attached metal seal. It is a question which all this array of cards perhaps will not solve; but it has greatly helped me, with the help of the gentlemen who have kindly contributed to it.

Mr. WALLENMEYER. Mr. Chairman, I move that the secretary of this conference be instructed to send a request to all manufacturers of computing scales, or those with whom he can get in touch, to provide on their scales a means of attachment for the seal. We have a

great deal of trouble in attaching the seal. I know from what I have heard from the various representatives of computing-scale companies, at least the leading companies, that they will provide a little slide that can be soldered on so that the seal can be slipped through.

Mr. NEALE. I second the motion, Mr. Chairman. I would say that I had that in mind—that when the tolerance and specification committee put in their report that should be provided.

The ACTING CHAIRMAN. The motion is that the secretary put himself in communication with the manufacturers of computing scales, asking them to place on their scales a device for the attachment of the seal. Is there any discussion?

Mr. RADCLIFFE. Mr. Chairman, I notice in going about and testing these scales that the seal is put so low that children can get hold of it and twist it off. Now, if there is a loop or hole put in some part of the mechanism of the machine at the top, where the children can not get at it—grown people do not take them off; it is the children—and then put a wire through and fasten the seal on, I think that will solve the problem.

Mr. NEALE. Mr. Chairman, before the motion is put, I think it should be made more general, and I think our specification committee could handle the matter by demanding of all manufacturers that on scales of all makes there shall be a proper means of sealing, be it a ring or whatever it may be. I think the specification committee could handle it in that way.

Mr. WULFSON. Mr. Chairman, I suppose you know there are different types of scales, and on some scales you put a sticking plaster, and on other scales you put a little lead. Now, I am talking from experience, and I say, leave this seal proposition where it is. If you use stickers, you can put a sticker on; if you use hangers, you can put a hanger on. It is up to you. You will have to have two or three hooks on every scale, and mark them, "This is for a lead seal," and "This is for a sticker," and "This is for something else."

The question was taken, and the motion was agreed to.

REPORT OF COMMITTEE ON TOLERANCES AND SPECIFICATIONS.

Presented by Mr. JOHN C. CONNORS.

The committee respectfully submit the tolerances and specifications which have already been placed in your hands.

During the past two years we have held numerous meetings in New York, Boston, and Washington, and while our report is not very bulky, an enormous amount of work has been performed.

In reaching these conclusions we have tried to the best of our ability to keep in mind the interests of the public, the manufacturer, and the sealer. We have consulted the existing regulations both of this country and of foreign countries and we believe that the regulations which we have presented are fair and just to the three interests involved, also that they are reasonable and can be enforced.

The committee wishes to state that in making up these regulations much attention was given to the larger types of scales with

reading faces or dials, such as platform, automatic, and semiautomatic scales for weighing freight, dial attachments on platform scale beams, etc., but at this time the committee is not ready to report on these types. It is necessary that these be treated as a special subject and if the conference so desires, this will be taken up and regulations for these types mailed to each member at an early date.

The committee wish to express their thanks for the assistance rendered by Commissioner John L. Walsh, of New York City, and to Mr. Holbrook and Mr. Briggs, of the Bureau of Standards

LINEAR MEASURES.

Specifications.—Measures of length may be graduated in yards, meters, feet, or inches with customary subdivisions, provided that nothing in this section shall prevent the subdivision of the Gunter's chain into links.

Main divisions shall be plainly designated and the length of their graduation shall be longer than that of the intermediate subdivisions. Intermediate subdivisions shall be varied in length that they may be conveniently read.

Lines shall not be greater in width than one-fourth of the smallest subdivision. Provided, however, that in no case shall the line be wider than three one-hundreths inch.

All graduations must be spaced uniformly and be perpendicular to the edge of measure.

Measures of length may be made of any material whose form or dimensions remain reasonably permanent under normal conditions, for example, steel, brass, hardwood, etc. Provided, however, that tapes for commercial purposes may be made of wire-woven cloth.

The ends of wooden measures shall be protected by metal firmly attached to the measures.

Length measures shall be smooth and straight.

No counter tacks shall be allowed.

In States where the law requires tapes to be sealed, the tension, temperature, method of support, and correction should be stated by the sealer in a certificate.

On all measures of length except tapes of steel or other metal the following tolerances shall be allowed:

Length.	Tolerance.
Feet.	*Inch.*
6	3/16
5	5/32
4	1/8
3	3/32
2	1/16
1	1/32
[1] 1/2	1/64

[1] Or less.

Tapes of steel or other metal which have errors exceeding those in the following table should not be sealed:

Length.	Allowable error.	Tension.
Feet.	*Inch.*	*Pounds.*
100	1/4	10
66	3/16	10
50	1/8	10
33	3/32	10
25	1/16	10
10	1/16	5
6	1/32	5
3	1/32	5

LIQUID CAPACITY MEASURES.

(NOT INCLUDING GRADUATED GLASSWARE.)

Specifications.—Liquid measures must be made strong enough to withstand ordinary usage without becoming easily bent, indented, or damaged, and should be made of enamel ware, metal, glass, or composition.

Liquid measures must be such that the capacity is determined by a definite edge at the top of the measure, and graduating rings, except those placed to strengthen the measure, will not be allowed. These reinforcing rings must be so placed that they can not be mistaken for graduation.

The capacity shall be legibly and permanently indicated on the side of the measure. On enamel and composition measures this marking shall be of a different color than that of the measure.

In a liquid measure having a tap, this tap must completely empty the measure without tilting and when pouring lip is provided the measure must hold its full capacity without the contents running into the lip.

The following errors are allowable:

Measure.	Tolerance.		Measure.	Tolerance.	
	Fluid ounce.	Cubic inch.		Fluid dram.	Cubic inch.
10-gallon	5	9	1-gallon	4	0.9
5-gallon	3	5.4	½-gallon	3	.68
4-gallon	2	3.6	1-quart	2	.45
3-gallon	2	3.6	1-pint	1.5	.34
2-gallon	1	1.8	½-pint	1	.22
			1-gill	1	.22

MEASURING PUMPS.

Specifications.—All stops, where there are such, should be so arranged that they can be sealed in such a manner that the stops can not be changed without destroying the seal.

The amounts delivered shall be correct within the tolerances specified for liquid measures.

The amounts delivered shall be correct irrespective of the speed with which it may be operated or whether it has been unused for any length of time.

DRY CAPACITY MEASURES.

Specifications.—Dry capacity measures must be made of metal, well-dried wood or composition and must be strong enough to stand the use to which they are subjected without materially changing their shape or becoming indented.

All dry measures up to and including one-half bushel shall be cylindrical and circular in cross-section: *Provided, however,* That measures may be used if the diameter of the top is not more than 10 per cent greater than that of the bottom diameter. In no case must the top diameter be less than that of the bottom.

The bottoms must be flat and perpendicular to the axis of the measure: *Provided, however,* That for strengthening purposes the bottoms of metal measures may be slightly corrugated. These corrugations may be straight or radial but not concentric.

Wooden measures above 1 pint shall have a metal band around the top.

Measures of 1 bushel and over must be equipped with handles.

Baskets used as measures shall not be less than one-half bushel capacity.

The capacity of the measure shall be defined by the top rim.

Containers which are not of the capacity of a bushel, its multiples, or its binary subdivisions shall not be used as measures.

The capacity shall be plainly marked on the side and shall be preceded by the word "Dry" in the case of the quart, pint, and half pint. The letters shall be at least one-half inch high and one-fourth inch wide.

Double capacity measures or measures with one end used for one capacity and the other for a different capacity shall not be used.

Measures for measuring dry commodities shall have the following minimum diameters:

Measure.	Minimum diameter.
	Inches.
½ bushel	13¼
1 peck	10⅞
½ peck	8½
2 quarts	6⅝
1 quart	5⅜
1 pint	4

The following errors are allowable:

Measure.	Tolerance.
	Cubic inches
1 bushel....	25.0
½ bushel....	15.0
1 peck.....	8.0
½ peck.....	5.0
2 quarts....	2.5
1 quart.....	1.5
1 pint.....	1.0
½ pint.....	.5
¼ pint.....	.25

Double these errors should be allowable for baskets used in the sale of berries and small fruits.

SCALES.

GENERAL SPECIFICATIONS.

Where the scale is not equipped with a full capacity beam or reading face, which together with beam or runner indicates the capacity, the maximum capacity must be clearly and permanently placed on the scale where it can be easily seen.

The construction of all scales must be such that they will bear the maximum capacity without perceptibly bending, straining, or loosening the parts.

All knife-edges must be firmly attached.

The knife-edges must be of hardened and tempered steel. They must be sharp throughout their entire length of bearing contact and bear evenly the length of their working parts.

Bearing covers which are liable to come in contact with the knife-edges must be smooth and of a material equal in hardness to the knife-edge. The part of the knife-edge coming in such contact must be so constructed that the friction due to this cause is reduced to a minimum.

If the scale has interchangeable or reversible parts, the interchange or reversal must not affect the accuracy of the instrument.

The position of all nose irons shall be clearly indicated by a well-defined mark, showing the position of these parts when the scale was installed.

Scales equipped with a scoop counterbalanced by a removable poise or weight must not be used.

The graduations on all beams shall consist of sharply defined lines or notches, which must be uniform in spacing and character and parallel to each other.

Weight graduations on the beam must indicate the weight represented by the poise.

A shoulder stop must be provided on all beams to prevent the poise traveling back of the zero graduation.

The adjusting material in all poises must be securely inclosed and permanently attached, and in such a position that it will not rub on the beam.

Where the poise is equipped with a set screw, this must be permanently attached and not removable.

Where the poise is provided with a device intended to engage in the notches this must fit firmly and without perceptible movement.

The bearing edge of hanging poises must be hard and sharp.

Poises must not be readily detachable from the beam.

The normal position of the beam shall be horizontal.

Unstable or accelerating scales shall not be used.

The term "bearing" herein referred to is defined as the entire contact between the knife-edge and bearing surface.

The term "sensibility reciprocal" hereinafter referred to is defined as the weight required to move the beam, pan, pointer, or other indicating device of a scale a definite amount. In scales provided with a beam and trig loop the sensibility reciprocal is the added weight required to be placed upon the platform to break and turn the beam from a horizontal position in the middle of the loop to a position of equilibrium at the top of the loop. This may be determined indirectly by subtracting the weight instead of adding it, or by using the sliding poise on the beam if this is moved without jarring the beam, etc.

In the case of scales with stabilized platforms such as even-armed trip scales and single platform scales such as postal scales, the sensibility reciprocal is the amount of added weight required on the platform to cause the pan to move from the normal position to a position of equilibrium at the limit of its motion.

In the use of scales provided with a pointer and graduated arc, it is the weight required to move the pointer over one division.

PLATFORM SCALES.

Specifications.—The foundation of all built-in scales shall be solid and firm.

All bearings shall be smooth and of a material at least equal in hardness to the knife edges. For scales of above 5,000 pounds capacity the bearings shall be made of steel tempered hard. The term "bearing" used in this paragraph refers to the entire line of contact between knife edges and their bearings and the point of contact between nose-iron steels and shackle bars.

Platform scales having an outside frame must be equipped with a checking or centering device which will keep the platform from binding against the frame and hold the platform bearings in their proper position on the main lever knife edges. These devices must not bind and must also cause the platform bearings to return to their normal line of contact on the knife edges when the platform is disturbed.

Scales with platforms must be so constructed that there is sufficient clearance between the platform and the frame to allow for any expansion due to weather effects. Sufficient clearance must also be provided that the live parts of the scale will not bind or be interfered with by the ordinary accumulation of dirt.

A wagon scale should have at least 12 feet of straight way on either side of the scale in the same plane as the platform.

Platforms and levers must be made sufficiently rigid that the degree of deflection under the maximum load will not affect the accuracy of the scale. When the scale is equipped with a relieving device its operation must not change the normal balance of the beam.

When corner platform loops are removable they must be marked to identify them with their proper corner.

The balance ball on all counter platform scales shall be so constructed that it can be operated only by a mechanical device.

Any device for altering the sensibility of the scale or which might cause the beam to become unstable or accelerating shall be so limited in adjustment that the beam can not be made unstable.

All beams shall be so marked and graduated that the value of the weight can be directly read on the beam at all points whether or not a registering or stamping device is used.

The beam shall have equal play above and below the normal horizontal position.

The minimum travel of the beam in the trig loop shall conform to the following table:

Length of beam:	Inch.
Under 12 inches	0.4
Over 12 inches and including 20 inches	.5
Over 20 inches and including 40 inches	.7
Over 40 inches and up	.9

The length of the beam refers to the distance from the fulcrum to the nearest point of the trig loop.

If the poise on a notched beam is equipped with a spring this shall be of sufficient strength to seat the pawl in its proper position wherever in the notch the pawl is placed.

Poises shall be so constructed that no part can be easily detached.

Reading edges or indicators of poises must be sharply defined and all reading edges must be parallel to the graduations.

The sensibility reciprocal of platform scales shall not exceed the value of two of the minimum graduations on the beam at the capacity or at any lesser load.

The tolerance allowed at any load must not exceed that in the following table, provided, however, that the tolerance in no case shall be less than the minimum graduation on the beam.

"Inside scales" are defined as scales that are used inside of a building.

"Outside scales" are defined as scales of the dormant, wagon, and railroad track type which are installed outside of a building.

The columns with the heading "On ratio" refers to the error in the ratio or multiplication of scales with which counterpoise weights are used.

The columns with the heading "Full capacity beam" refers to weightless or self contained scales.

The column with the heading "Load" refers to the amount of weight placed in any position on the scale platform.

The tolerances to be allowed on platform scales, at the loads indicated, shall not exceed the values given in the table following.

Load.	Inside scales.		Outside scales.	
	On ratio.	Full capacity beam.	On ratio.	Full capacity beam.
Pounds.	*Ounces.*	*Ounces.*		
50	½	1	.....	.....
100	1	2	.....	.....
200	2	4	.....	.....
240	3	6	.....	.....
300	3	6	.....	.....
400	4	8	.....	.....
600	6	12	.....	.....
		Pounds.		
800	8	1	.....	.....
1,000	8	1	.....	.....
1,200	10	1¼	.....	.....
1,500	12	1½	.....	.....
1,800	14	1¾	.....	.....
Tons.	*Pounds.*		*Pounds.*	*Pounds.*
1	1	2	2	4
1¼	1¼	2½	2½	5
2	2	4	4	8
3	3	6	6	12
4	4	8	8	16
5	5	10	10	20
6	6	12	12	24
8	8	16	16	32
10	10	20	20	40
12	12	24	24	48
15	15	30	30	60
20	20	40	40	80
40	40	80	80	160
50	50	100	100	200
80	80	160	160	320
100	100	200	200	400
150	150	300	300	600
200	200	400	400	800

Specifications.—Bearings must be made of a material equal at least to the knife-edges in hardness. (Tempered steel or agate may be used, but are not required.)

The shape of the bearings must be such that when the beam is displaced in any manner the knife-edges will return to their proper line of contact.

The under connections must form a parallelogram with a line joining the knife-edges in the beam. These connections must be straight and work freely.

All material used for balancing the scale must be securely inclosed.

Attachments for adjusting the balance of the scale must be of such character that they can only be operated by the use of an outside mechanical device.

Scales on which any weight or weights when used are not visible must be equipped with a device which will plainly indicate on the customer's side of the scale when the weight or weights have been added and their value.

Pendulum scales must be equipped with a device for indicating when the scale is level.

Pendulum scales must be equipped with leveling devices which require the use of an outside mechanical device for their operation.

When a weight equal to one-half the capacity of the scale is placed upon the weight plate in such a position that the edge of the weight coincides with the edge of the plate, the allowable error in the scale should not exceed the allowable error for the scale at its full capacity.

When a weight equal to one-half the capacity of the scale is shifted on the commodity plate or scoop to a point one-half the distance between the center and edge of the plate or scoop, the error should not exceed the allowable error for the scale at its full capacity.

When scales are equipped with a graduated beam, the sensibility reciprocal allowed shall not be greater than two of the smallest graduations on the beam: *Provided, however,* That in no case shall the sensibility reciprocal allowed be greater than that in the table below.

The minimum fall or drop of the plate or scoop on equal-armed scales from its highest point shall be as follows:

	Inch.
Capacity, 4 pounds and below	0.35
Capacity, 4 pounds to 12 pounds	.5
Capacity, 12 pounds to 26 pounds	.75
Capacity, 26 pounds and upward	1

On scales equipped with graduated beams the error allowed at any point on the beam shall not exceed the same proportional part of the error allowed at the capacity of the scale that the weight represented by the poise at that point on the beam bears to the capacity of the scale: *Provided, however,* That the tolerance shall in no case be less than one-fourth of the sensibility reciprocal of the scale.

Except on special tests mentioned above, the tolerances and sensibility reciprocal must not exceed those given in the tables below:

Capacity.	Tolerance.	Sensibility reciprocal.	Capacity.	Tolerance.	Sensibility reciprocal.
Pounds.	*Ounces.*	*Ounces.*	*Pounds.*	*Ounces.*	*Ounces.*
1	1/16	1/8	24	3/8	1
2	1/16	1/8	25	3/8	1
4	1/8	1/4	30	3/8	1
5	1/8	1/4	40	7/16	1½
6	1/8	1/4	50	1/2	1½
8	1/4	1/2	60	1/2	1½
10	1/4	1/2	75	5/8	2
12	1/4	1/2	90	7/8	2½
15	5/16	3/4	100	1	3
20	5/16	3/4			

SPRING BALANCES.

[NOTE.—The following specifications and tolerances are to apply to all spring balances except in so far as they are modified for special types, under the subheads given hereafter.]

Specifications.—Graduated faces must be permanently fixed in position.

All graduations must be clear and distinct and equally spaced.

The clear interval between the graduations must be not less than 0.04 inch.

The pointer must be firmly attached and reach to the graduated divisions. That part of the pointer which reaches to the smallest subdivisions must not exceed the width of these divisions.

The distance from the pointer to the reading face must not exceed 0.12 inch.

All devices for adjusting must be such that they are accessible or operative only by the use of an outside mechanical device.

No device to alter the working length of the spring shall be placed on the outside of the balance.

When there is no load the indicator shall clearly point to the zero graduation and there shall be no stop to prevent the indicator going beyond the zero graduation.

When the graduations commence at a fixed load the position of the pointer when there is no load shall be clearly indicated by a zero graduation.

Hanging spring scales shall be freely suspended from the ring when in use.

If provided with a hanging pan this shall be hung to a ring and no hook will be allowed; provided, however, that a hook may be used if no pan is provided.

Where a dish-shaped pan is provided there shall be an opening in said pan to allow for drainage.

When a weight equal to one-half the capacity of the scale is shifted to a point one-half the distance between the center and edge of the plate or scoop the error should not exceed the allowable error for the scale at its full capacity.

Spring balances on which a weight or weights when used are not visible must be equipped with a device which will indicate on the customers' side when the weight or weights have been added and their value.

The value of the graduations on spring balances used in the sale of foodstuffs at retail shall not be more than 1 ounce; provided, however, that this shall not apply to scales used exclusively in the sale of vegetables.

Spring balances must give correct results whether the load is increased or decreased.

The specifications for each part of combination spring and lever balances shall be the same as those for the class to which such part belongs.

With the exception of the special test noted above, spring balances must be correct within the following tolerances; provided, however, that in no case shall the tolerance be less than $\frac{1}{4}$ of the minimum graduation on the reading face.

This table specifies the tolerance to be allowed at the values indicated and does not refer to the capacity of the balance.

Graduations.	Tolerances.	Graduations.	Tolerances.	Graduations.	Tolerances.	Graduations.	Tolerances.
Pounds.	*Ounces.*	*Pounds.*	*Ounces.*	*Pounds.*	*Ounces.*	*Pounds.*	*Ounces.*
1	1/8	8	3/4	30	2	150	6
2	1/4	10	3/4	40	2	200	8
3	1/4	12	1	50	3	300	12
4	1/2	15	1	60	3	400	16
5	1/2	20	$1\frac{1}{2}$	75	4	500	20
6	1/2	24	$1\frac{1}{2}$	90	4	600	24
7	1/2	25	$1\frac{1}{2}$	120	4		

STRAIGHT-FACE SPRING BALANCES.

Specifications.—The support for the spring must be of sufficient strength and rigidity to sustain the maximum load without perceptible strain and it must be permanently fixed.

The graduated face must be firmly riveted to the frame at not less than three points.

The indicator must be pointed in order to facilitate accurate readings and it must not obscure the figures showing the values of the graduations.

The value and spacing of the graduations shall satisfy the requirements of the following table:

Capacity.	Maximum value of interval.	Minimum distance between graduations.
Pounds.	*Pound.*	*Inch.*
25	1/2	0.03
50	1	.03
100	1	.03
200	2	.03
300	5	.04
400	5	.04
500	5	.04

The tolerance to be allowed shall be four times that given in the preceding table for spring balances.

COMPUTING SCALES.

Specifications.—Computing scales must be correct in both their weight and value indications.

Charts which repeat the same values in any given column or row are incorrect. This also applies to charts on which value graduations are correctly placed but which, in addition, have a duplication of value figures in any given column or row.

The maximum value graduations on the chart must not exceed 2 cents.

On all scales equipped with a drum-shaped chart the opening on the dealers' side must be such that at least two value indications at the lowest price per pound may always be visible. Computing scales must be so constructed that the ounce graduation and a figure representing the proper number of pounds will show on the customers' side when the load is placed on the pan or platform.

The distance between the chart and the reference mark must not exceed 0.06 inch. Reference marks must be present on both the dealers' and customers' side, and their width must not exceed the width of the finest graduation on the chart. Both reference marks must indicate clearly and correctly.

The maximum value of the weight indications shall be 1 ounce.

The width of the value indicator must not exceed the width of the value graduations.

On scales equipped with a magnifying device the clear interval between the weight and value graduations shall not be less than 0.02 inch. On scales not equipped with a magnifying device the clear interval between weight and value indications shall not be less than 0.04 inch.

All devices for adjusting shall be accessible or operative only by the use of an outside mechanical device.

The specifications as to the other parts of computing scales not modified by the above shall be the same as those of the class to which they belong.

CREAM TEST AND BUTTER-FAT TEST SCALES.

Specifications.—The scale shall be provided with a graduated scale of at least 10 divisions, over which the pointer shall play.

The pointer must reach to the graduated divisions and shall terminate in a fine point to enable the readings to be made clearly and distinctly.

The clear interval between the divisions on the graduated face shall shall not be less than 0.05 inch.

The scale shall be provided with leveling screws and an attached level.

The scale shall be so constructed and adjusted that when the pans are released or disturbed the pointer will return to rest at the zero mark.

The addition of one-half grain to the scale when loaded to capacity shall cause a movement of the pointer at least equal to one division on the graduated face.

The tolerance either in excess or deficiency when the scale is fully loaded shall be 1 grain.

WEIGHTS.

Specifications.—Weights shall be made of steel, iron, brass, or any other metal or alloy of metals not softer than brass: *Provided, however,* that weights below one-fourth ounce shall not be made of iron or steel but may be made of aluminum.

Weights must have smooth surfaces and no sharp points or corners.

Weights must not be covered with a soft or thick coat of paint or varnish.

All holes in which foreign material is placed for adjusting purposes must be so made that the bottom diameter is larger than the top diameter. The adjusting material must not project beyond the surface of the weight and must be securely held in place.

Rings on weights shall not be split or removable.

All weights shall be clearly marked to show their value, and in addition weights intended to be used on multiplying lever scales must be clearly marked to show the weight they represent on the scale.

The tolerances allowed for commercial weights shall not exceed the values given in the following table:

[Manufacturers' tolerances or the tolerances on new weights are one-half of the values listed.]

Weight.	Ordinary weights (ratio 1 : 1).	Counterpoise weights for multiplying-lever scales.		
		Ratio less than 100 : 1.	Ratio 100 : 1 and less than 1,000 : 1.	Ratio 1,000 : 1 and over.
Pounds.	*Grains.*	*Grains.*	*Grains.*	*Grains.*
50	100.0	60.0	40.0	20.0
25	60.0	36.0	24.0	12.0
20	60.0	36.0	24.0	12.0
15	40.0	24.0	16.0	8.0
10	40.0	24.0	16.0	8.0
8	30.0	18.0	12.0	6.0
5	30.0	18.0	12.0	6.0
4	20.0	12.0	8.0	4.0
3	20.0	12.0	8.0	4.0
2	15.0	9.0	6.0	3.0
1	10.0	6.0	4.0	2.0
Ounces.				
10	10.0	6.0	4.0	2.0
8	5.0	3.0	2.0	1.0
5	5.0	3.0	2.0	1.0
4	5.0	3.0	2.0	1.0
2	3.0	1.8	1.2	.6
1	2.0	1.2	.8	.4
1/2	2.0	1.2	.8	.4
1/4	1.0	.6	.4	.2
1/8	.5	.3	.2	.1
1/16	.5	.3	.2	.1
1/32	.5	.3	.2	.1
1/64	.2	.12	.08	.04
Ratio of tolerances.....	5/5	3/5	2/5	1/5

The tolerances allowed on apothecaries prescription weights shall not exceed the values given in the following table:

Weight.	Tolerances.	Weight.	Tolerances.
Ounces Troy.	*Grains.*	*Scruples.*	*Grains.*
12	4.0	3	0.3
10	4.0	2	.3
8	3.0	1	.15
5	3.0		
4	2.0	*Grains.*	
3	2.0	20	.15
2	2.0	15	.15
1	1.0	10	.10
		5	.08
Drachms.		1	.03
8	1.0		
6	1.0		
4	.7		
3	.6		
2	.5		
1	.3		

Weight.	Tolerances.	Weight.	Tolerances.
Kilograms.	*Milligrams.*	*Grams.*	*Milligrams.*
10	2,000.0	10	40.0
5	1,500.0	5	20.0
2	800.0	2	15.0
1	500.0	1	10.0
Grams.		*Milligrams.*	
500	350.0	500	6.0
200	200.0	200	6.0
100	150.0	100	2.5
50	100.0	50	2.0
20	50.0		

DISCUSSION.

The ACTING CHAIRMAN. You have heard the report of the committee on tolerances and specifications.

Mr. FINE. I move that the report be accepted.

(The motion was seconded.)

Mr. KELLEY. I offer an amendment that the committee be discharged.

(Cries of "No! No!")

(The question was taken and the report was accepted.)

The ACTING CHAIRMAN. This brings us to the order of unfinished business. Have we any?

The SECRETARY. I do not think there is any, Mr. Chairman.

The ACTING CHAIRMAN. There is no unfinished business. Have we any new business?

Mr. WULFSON. Mr. Chairman, on the first day I believe I made a remark about a peck measure. This is supposed to be a peck [indicating a peck measure with a small diameter].

The law requires 15 pounds of potatoes to a peck. You may heap up this particular measure as much as it will hold—put your hand on it, too—and the most you can get in it is, perhaps, 13 pounds. This is because of the small diameter. Dry measures ought to be uniform, because the manufacturers sell those measures to the wholesale dealer, the wholesaler sells them to the middleman, the middleman sells them to the huckster, and when you condemn those measures the owners say, "I bought this measure this way." You go to the wholesaler and he says, "It was sent from the factory this way; it is nothing to me; I pay for it; this is the way it was shipped to me, and this is the way I sell it"; and at the same time, gentlemen, you can not put in the amount required by law. So I move, Mr. Chairman, that this conference adopt a recommendation that the National Bureau of Standards notify each manufacturer of measures that they make a measure of such shape that you can heap it up enough to deliver the amount required. Is there a second?

(Cries of "No! No!")

REPORT OF COMMITTEE ON RESOLUTIONS.

Presented by O. Evans Mikesell.

Whereas at the eighth annual conference of officials throughout the United States having to do with weights and measures within their respective localities relative to the constitutional provision regarding weights and measures, such meeting being held by the courtesy of the National Bureau of Standards at their buildings on Pierce Mill Road, said sessions being on the 14th to 17th of May, 1913, by unanimous vote of such conference duly passed instructing a subcommittee of said conference to formulate and submit suitable resolutions covering the subjects and purposes expressed in said resolutions; therefore be it

Resolved, That it is the sense of this meeting that the recommendation of the commissioner of the bureau of weights and measures of New York City that the National Bureau of Standards be given authority to pass upon and authorize the use of types of weighing and measuring apparatus be indorsed by the conference, and that a copy of this resolution be sent to each member of the Committee on Coinage, Weights, and Measures of the House of Representatives and members of the Committee on Standards, Weights, and Measures of the Senate.

Resolved, That the eighth annual conference on weights and measures indorses the bill to establish the standard barrel, No. 4899, indorsed and introduced in the House of Representatives by the Hon. William E. Tuttle, of New Jersey.

Resolved, That we recognize that the public press of our country is the most potent factor to mold public sentiment for or against the will of the people, when expressed without political prejudices, with a tolerance of opinions of others, and we render unto them our united thanks for their just and impartial report of the proceedings of this conference.

Resolved, That this conference is in favor of the adoption of the metric carat weight of 200 milligrams as the standard of weight for precious stones.

Resolved, That this conference owes it as a duty to the Bureau of Standards and its employees to render thanks for the many courtesies rendered to members of this conference.

Resolved, That this conference has been greatly benefited and instructed by the exhibits of the various scientific and mechanical appliances shown us by the respective representatives of the manufacturers thereof, showing the improved and progressive inventions in the science of weights and measures.

Resolved, That it is the sense of this conference that there should be a committee on publicity for the purpose of aiding the press in giving to the people exhaustive and accurate accounts of the doings of this conference.

Resolved, That it is the sense of this conference assembled that we go on record as favoring the retaining of competent officials for weights

and measures and that they be placed under the civil-service regulations in their respective States.

Resolved, That this conference extend thanks to the members of the last session of Congress for its passage of amendment No. 22576 to the pure food and drugs act of June 30, 1906, establishing net weight in this country, and House bill No. 21480, establishing a standard barrel and standard grades for apples when packed in barrels and for other purposes.

Respectfully submitted,

O. Evans Mikesell.
Ed. J. Maroney.
Fred C. Albrecht.

Mr. Fine. Mr. Chairman, I move you that these resolutions be accepted.

(The motion was seconded and the report was accepted.)

The Secretary. I would like to call attention, if I may, to the work of one particular man here, Mr. Mikesell. I have on a number of occasions attempted to get some publicity for our meetings, and I just found out from observing Mr. Mikesell's activity here why I did not get it before—why I did not have the ghost of a chance to get it. He has done nothing else; he has not eaten, he has not slept, as far as I can see; and it seems to me that unusual activity of that kind ought not to go unnoticed by this conference. It certainly gives me great pleasure to acknowledge my indebtedness to Mr. Mikesell for what he has done in this direction.

Mr. Maroney. I move we adjourn, Mr. Chairman.

(The motion was seconded and agreed to. Accordingly, at 5 p. m., the meeting adjourned.)

SIXTH SESSION (MORNING OF MAY 17, 1913).

The conference reassembled at 10.20 a. m., Mr. Waldron presiding.

The SECRETARY. Mr. Chairman, I would like to make a few announcements. Several gentlemen came in after the reports of the State and city officials had been given, and I would like to have permission to insert in our report any remarks that these gentlemen who arrived late might see fit to submit. If it is necessary to make a motion to that effect, I wish someone would make such a motion.

I would also request leave to print several papers that appear on the program, but which have not been read, Dr. Reichmann's, for instance.

I also have several communications. It seems to me, if you will just make a general resolution, that they might be published.

Mr. CLARK. Mr. Chairman, I move that the secretary be directed to insert any documents of value.

The motion was seconded and agreed to.

LEGISLATION: PROPOSED AMENDMENTS AND ADDITIONS TO THE MODEL STATE LAW ON THE SUBJECT OF WEIGHTS AND MEASURES.

By F. S. HOLBROOK, *Associate Physicist, Bureau of Standards.*

Mr. President and gentlemen, at the inception of the Annual Conferences on the Weights and Measures of the United States it was found that the laws on the subject of weights and measures of the States of the United States were antiquated, weak, and contradictory in their provisions, and furthermore, that in very few States was any attempt being made to enforce such requirements as they contained. It was early recognized that new and strict statutes were absolutely necessary in every State if faulty weights, measures, and apparatus were to be eliminated from commercial use, and if the delivery of short amounts of commodity was to be prevented. With the idea of the enactment of new laws in mind it was very natural that the small number of delegates should consult one another as to the provisions that should be included. It was apparent to all of them that unless the laws about to be enacted by the several States were uniform the enforcement of all of them would be made very much more difficult, and there would be a very great lack of efficiency in administration. The conclusion was inevitable that the conference should make some official recommendations on the question of State legislation if it was to be of the maximum assistance in the improvement of conditions then existing throughout the States.

Dr. Stratton remarked on the occasion of the first annual conference, "It seems to me that it is very evident that we could bring

about uniform State legislation, or national legislation." And at the first conference, also, a resolution was presented on behalf of the committee on organization, and was adopted, which read as follows:

Resolved, That it is the sense of this convention that meetings of State Sealers or custodians of weights and measures be held annually in Washington to discuss and facilitate both national and State legislation tending toward securing uniformity in the laws pertaining to weights and measures and their inspection throughout the United States, and the Bureau of Standards is requested to arrange such a meeting.

At the second annual conference the question of procuring uniformity in the laws of the various States was again discussed, and at that meeting the following resolution, introduced by Dr. Reichmann, of New York, was passed:

Resolved, That the executive committee be instructed to draw up a model set of laws to be submitted to this body at its next meeting.

In accordance with this resolution the executive committee of the conference prepared a set of "Suggestions for national and State laws," embraced in 34 sections, and their recommendations were adopted by the conference. These were, as the name implies, merely suggestions on which laws for the various States were to be based.

The next step in this matter was taken at the Sixth Annual Conference on Weights and Measures, when a model law on the subject of weights and measures, drafted by the Bureau of Standards, due consideration being had for the "Suggestions for national and State laws," and for the various bills which had been framed in accordance with these suggestions and introduced in some of the States, was presented for the action of the conference. After debate on the various provisions and a few minor changes and additions, this model law was adopted by the national conference and recommended for passage to the various States.

This, then, is the model law which we have to-day, and it is this law that we propose to amplify and amend. It was recognized at the time this bill was adopted that it did not contain all the provisions that would be found necessary for the elimination of all character of frauds. But at that time very few of the States had any adequate laws on the subject of weights and measures, and, moreover, the general subject and the necessity for legislation was not nearly so well understood as it is at the present time. In introducing bills it was therefore necessary to avoid very great detail, as this would necessarily have delayed and in many cases actually prevented the passage of the legislation altogether. But we believe that the time has now come when new sections of a more detailed nature should be added. Not only is the subject now such a familiar one that details can safely be taken up, but many States, having established a foundation, are ready to amplify the laws already obtained. To carry out the original idea of uniformity, such States should have some model to turn to when framing new sections for their laws. We will therefore present for your consideration several new sections. So much for the additions which should be made.

Now to take up the question of amendment. In this matter we do not propose anything radical. But some amendments seem to be necessary. The sections of the present law are in many cases very long and therefore appear to be more complicated than they really are. In these cases we advocate the splitting up of such sections into several shorter sections, referring to a smaller part of the subject. The law is thus made easier to understand and more simple for reference and consultation. We believe also that the arrangement of provisions can be improved in this way. In other cases the amendments will suggest a somewhat simpler wording than is used at present, resulting in a little clearer meaning in these cases. In no case need those States which have already adopted this law in whole or in part feel that their laws will not be uniform with those of States which may pass the amended law hereafter as the changes so far suggested are not of sufficient importance to make this the case.

The remainder of the amendments consist in presenting the law in three different forms instead of in one standard form as has been done heretofore. The basic provisions of all three forms are exactly the same, the only variations occurring in the methods of enforcement involved. It has been conclusively proven that the original form is not directly applicable to many of the States and that to gain respectful attention in some of these States it is necessary to submit it in a practicable form, applicable to local conditions. No desirable uniformity is sacrificed by presenting it in these various forms.

The following is a brief description of the three forms and of the local conditions in which each will be found to be peculiarly applicable:

FORM NO. 1.

This form provides that the entire weights and measures inspection system shall be in the hands of a State department and that the weights and measures laws shall be wholly enforced by men in the service of the State.

This form is intended primarily for States having a comparatively small population per unit of area and few large centers of population; and, secondarily, for those States in which it is believed that such a law can be most competently enforced by a centralization of power.

FORM NO. 2.

This form provides that the State shall take entire charge of the enforcement of the law in those jurisdictions in which the population per unit of area is so small that local authority can not enforce the provisions with the highest efficiency and that in those jurisdictions where the population is large enough to justify it a local inspection service under the supervisory authority of the State department shall take up the enforcement of the provisions of the law.

This form is primarily intended for those States having part of their territory thickly settled and other parts only thinly settled.

FORM NO. 3.

This is the original form of the model law and provides for the enforcement of the provisions by local inspectors in each city and each county, all under the general supervisory control of a State department of weights and measures.

This form is intended for those States having a large population per unit of area and none or but few sections which are sparsely settled.

With this introduction we desire to present the amended model law to you for your action thereon.[1]

DISCUSSION.

Mr. HOLBROOK. Now I will run through these amendments very rapidly. I would request that I be not obliged to read all these; I will read any that I believe to be of real importance. Where the change is merely a correction or an improvement in phraseology, I think we can pass over it without discussion; and also, in regard to the question of splitting these longer sections up into smaller sections, it does not seem to me to be necessary to describe in detail how these sections are divided, since the phraseology in most cases is not changed.

Briefly, I might state that whereas there were about 12 sections in the old law, there are 22 sections in this revision. Some of the longer sections perhaps you will remember. Section 3, specifying the duties of the superintendent of weights and measures and his deputies and inspectors, and section 6, specifying the duties of the county sealers of weights and measures, are split up into about four sections each, those former sections being unwieldy and bulky.

Mr. RICHARDSON. Would it be too much trouble for you to read the sections of the old law that you want to amend, and read the amendments proposed?

Mr. HOLBROOK. That can of course be done although it will consume quite a lot of time.

Mr. GOODWIN. If I may interrupt Mr. Richardson, will those recommendations be embodied in our annual report?

Mr. HOLBROOK. They will be; yes.

Mr. GOODWIN (addressing Mr. Richardson). Those will all be in the report when we receive it from the Bureau of Standards, and that will give us all the information.

Mr. HOLBROOK. I will take that up in whichever way the conference desires. If necessary, I think we can get a number of copies of the model law as it now stands, and you might follow me through the various sections, change by change, if you wish.

Mr. RADCLIFFE. I would like to have a copy of that model law.

Mr. MONTGOMERY. I would like to have a copy of that model law, Mr. Chairman.

Mr. HOLBROOK. In that case, in order that we may not waste time, we will defer consideration of the changes in the present model law

[1] See appendix, pp. 275–291.

and take up a few of the sections which we believe it is necessary to add to the model law; and we will take up the amendments to the old sections afterwards.

Now, you all know that we have been trying for years to get a section into our State laws and into our National law in relation to the sale of commodities in containers, requiring the weight, measure, or numerical count to be marked on the outside of the container. Up to this year seven States had passed what is known as a net contents of container law, and there was some lack of uniformity in the provisions of the various States. A short time ago, as you will remember from Mr. Fischer's report, the National pure food law was amended to make it compulsory to mark containers of food. Inasmuch as we now have a national law on the subject, it does not seem to me that we can do anything but incorporate the provisions of the national law into the law recommended for the various States, since uniformity is so much to be desired in weights and measures legislation; and for another reason, namely, that it might be difficult to enforce a State law which did not agree with the national law, on account of the interstate commerce provisions. That matter is very little understood at the present time, I believe, especially in view of the recent decision by the Supreme Court which Mr. Fischer mentioned, which makes it doubtful in the minds of some to what extent the State has the right to regulate the marking of packages at any time. They certainly can not regulate the sale of goods which are guaranteed under the pure food law to the extent of requiring the label on the goods as they come into the State to be obliterated, on the ground that this would make the enforcement of the national law an impossibility, since until the wholesale packages are split up into retail packages and these put upon the shelves of the retailer it is impossible for the United States inspectors to examine them to see whether they comply with the provisions of the law; and were the label mutilated the enforcement of the pure food law of the United States would no longer be possible.

I will now read the section that we propose:

It shall be unlawful to keep for the purpose of sale, offer or expose for sale, or sell any commodity in package form unless the net quantity of the contents be plainly and conspicuously marked on the outside of the package in terms of weight, measure, or numerical count: *Provided, however*, That reasonable variations or tolerances shall be permitted and that these reasonable variations or tolerances and also exemptions as to small packages shall be established by rules and regulations made by the superintendent of weights and measures: *And provided further*, That this section shall not be construed to apply to those commodities in package form the manner of sale of which is specifically regulated by the provisions of other sections of this act.

Now, that is based on the national food and drugs act. However, it goes further than the national law in that it specifies all commodities instead of simply food products. On account of the fact that the paragraph amended covers only foods, the national law was necessarily confined to foods. Now, there is no reason why it should be confined to foods when the State enacts it, inasmuch as these laws are to be enforced by the weights and measures authorities. Therefore this section specifies all commodities instead of food products only. In other respects the section follows very closely the national law.

In connection with the pure-food law there has been a very great diversity of opinion as to the proper definition of the word "package," that definition not having been given in the law itself. The Agricultural Department, however, issued a set of rules and regulations in which the words "original package" were defined. Whether that definition is recognized by the courts I do not know.

This recent case, the "Karo sirup case," as it is called (George McDermott *v.* State of Wisconsin, United States Supreme Court decision of Apr. 7, 1913), defines the word "package"—not the original package, but simply the word "package" as used in section 3 of the pure-food law. It is stated that it shall be construed to mean the immediate container of the article which is intended to be delivered to the consumer. My definition of the word "package" is based on the definition given in the rules and regulations just referred to, since this seems to cover the matter. I desire to put that definition directly into the section, so that there may be no difficulty in the courts determining just what a package is. The definition is as follows:

The word "package" as used in this section shall be construed to include the package, carton, case, can, box, barrel, bottle, phial, or other receptacle put up by the manufacturer; or, when put up prior to the order of the commodity, by the vendor; which may be labeled, branded, or stenciled, or otherwise marked, or which may be suitable for labeling, branding, or stenciling, or marking otherwise, making one complete package of the commodity. The word "package" shall be construed to include both the wholesale and the retail package.

Now, there is one change in the first clause to which I might call attention; it requires that packages of goods which are put up by the merchant before the commodity is ordered, and are put upon his shelves, must be marked with their net weight. Now, we believe that this is necessary. The inspector of weights and measures in making his inspections will weigh packages which have already been done up by the grocer, and if he is not informed by marking on the outside of the package, he will be unable to determine whether the law is being violated or not. Packages of sugar may be put up and sold regularly as 5-pound packages, but when an inspector comes into the store and weighs those packages they may be found to weigh perhaps 4 pounds 9 ounces, 4 pounds 10 ounces, or 4 pounds 8 ounces. Now, the merchant will often declare that they were being sold as 4 pounds 8 ounce packages, for instance, and not as 5-pound packages.

Mr. CLUETT. Might it not be well to insert in there that in marking these packages the terms of weight, measure, or count shall be as conspicuous as anything else on that label? They are very apt to get the weight or measure in such fine print that one would need a microscope to discover it, and it would still be on the label.

Mr. HOLBROOK. We would run into difficulty in the enforcement, since if the States defined how the package should be marked, and the pure-food law of the United States did not require the same marking, a thing would be illegal in the State which would be legal in interstate commerce. The national law says that the package shall be plainly and conspicuously marked, and I think that we should consider that the National pure-food law will be enforced by the Government in a satisfactory way; that they will require such marking

as is desirable. I would not recommend in any case a wording in the State laws, or in the law that we are intending to submit to the States, that varies radically from the terms of the pure-food law which has just been enacted.

I do not know, gentlemen, how you desire to take this matter up, whether you desire to adopt this, section by section, or to lay all the sections aside until all have been presented to you.

The SECRETARY. Mr. Chairman, in view of the fact that the members of the conference have not been furnished with copies of these sections, I would suggest that the new sections, at any rate, be voted upon as Mr. Holbrook finishes explaining them. It will be impossible to vote on them afterwards, I think, unless you have copies. You will not know the order in which to bring them up, and it seems to me it would be desirable to do it at the present time.

The ACTING CHAIRMAN. Do you make that as a motion, Mr. Fischer?

The SECRETARY. More as a suggestion than anything else.

Mr. GOODWIN. I make that as a motion, Mr. Chairman.

Mr. NEALE. I second the motion.

The ACTING CHAIRMAN. Are there any remarks?

Mr. RICHARDSON. This is entirely new matter, is it not?

The SECRETARY. This is entirely new matter that Mr. Holbrook is discussing now. There are only eight sections.

The ACTING CHAIRMAN. Are there any other questions on the motion?

The question was taken and the motion was agreed to.

The ACTING CHAIRMAN. Are there any questions to be asked on that first section?

Mr. NEALE. Mr. President, my opinion coincided with Mr. Cluett's proposal on the subject, but Mr. Holbrook has cleared that up in my mind. I thought it was necessary perhaps—at least for intrastate business—to have the net weight, measure, or count as conspicuous as any other printing on the label, but Mr. Holbrook brings out the point that it would not be in conformity with the interstate law, so that settles my mind on the subject. I think it is best to leave it as Mr. Holbrook has it.

Mr. MONTGOMERY. I move the adoption of the section as read by Mr. Holbrook.

(The motion was seconded and the section was adopted.)

Mr. HOLBROOK. The next section which I will present is a proposed section for the model law relating to secondary standards. Now, this is unimportant in a way. In the former model law we have merely provided for the adoption of certain State standards of weights and measures—fundamental standards—and I find that there is a certain doubt in the minds of many legislators concerning this provision. They seem to consider that the State standards of weights and measures when adopted can be used for every purpose of the enforcement of the law. In other words, some of the legislators you may talk to seem to think that the State standards can be taken out and used to test coal scales, ice scales, and any kind of scales which are found in the markets; and of course this is ridicu-

lous. It was intended that the State standards should be fundamental standards of weights and measures and should be used just as seldom as possible, in order that they might not change from year to year. They are to be tested every 10 years by the National Bureau of Standards; and inasmuch as they are to be the highest type of weights and measures which are produced, it is the intention, I believe, in every State to keep these standards and use them only for checking up a certain set of copies of the State standards, these copies to be used in the work of the office and similar copies in the work in the field.

With that explanation, I will read this section:

In addition to the State standards of weights and measures provided for above, there shall be supplied by the State at least one complete set of copies of these, to be kept at all times in the office of the State superintendent and to be known as office standards; and such other weights, measures, and apparatus as may be found necessary to carry out the provisions of this act, to be known as working standards. Such weights, measures, and apparatus shall be verified by the State superintendent, or his deputy or inspectors at his direction, upon their initial receipt and at least once in each year thereafter, the office standards by direct comparison with the State standards, the working standards by comparison with the office standards. When found accurate upon these tests, the office and working standards shall be sealed by stamping on them the letter "—" and the last two figures of the year with seals which the State superintendent shall have and keep for that purpose. The office standards shall be used in making all comparisons of weights, measures, and weighing and measuring devices submitted for test in the office of the superintendent, and the State standards shall be used only in verifying the office standards and for scientific purposes.

Mr. BYRNE. Mr. President, I move the adoption of the second section.

(The motion was seconded.)

Mr. CLUETT. Might it not be well, before we adopt that, to insert a provision to the effect that the State superintendent shall furnish a certificate with those weights showing that he has stamped them? If we did not have that, would it not be necessary to subpœna the State superintendent if we had to prove our weights?

Mr. HOLBROOK. Mr. Cluett, this section refers merely to standards which are used, not by the city and county sealers, but by the State inspectors connected with the office of the State superintendent; and inasmuch as these inspectors and the State superintendent both test and use these standards they could, if it helped them any, issue certificates for them without having it so stated in the law; and at any rate they would always, on account of these seals, I think, be able to prove their own standards which they themselves are using. If that was a county or city standard, I think you would find it a different matter.

Mr. CLUETT. The reason I raised that point was that in Chicago we had our standards taken down to the secretary of state for inspection and sealing, and he merely stamped them with the letter "I." Now, we had to go into court on an important case and they wanted him to issue a certificate showing that he had tested them and put this letter "I" on the weights, and he refused to do it for a while. So they said, "All right, we will subpœna you and drag you to Chicago to testify in this case." I thought it would be well to have

a certificate showing that those were the weights on which he had put the seal.

Mr. GOODWIN. Mr. Chairman, I want to say that that is provided for in my State. We furnish every city and town in the State a set of standard weights and measures, which are adjusted, tried, and proved by the State sealer. Each sealer has a working set which he has to have tested at least once in every three years by the standards furnished by the State. Those standards are kept in the city or town for the benefit of the local sealers, so that they can go to their town house and verify their working standards. So that practically this thing is being carried out now in the State of Rhode Island. We find that it is a very great benefit to the local sealer.

Mr. HOLBROOK. You approve of the section as read?

Mr. GOODWIN. I do.

Mr. HENRY. Mr. Chairman, I would like to ask a question. Does that section provide for the comparison of the secondaries with the primaries once a year?

Mr. HOLBROOK. It provides that "such weights, measures, and apparatus," which refers to both the office and working standards, "shall be verified by the State superintendent, or his deputy or inspectors at his direction, upon their initial receipt and at least once in each year thereafter," but the office standards only are to be compared directly with the State standards.

Mr. HENRY. That is, the secondary with the gold standards, too, or just the working standards with the secondary?

Mr. HOLBROOK. It provides that the office standards shall be calibrated by means of the State standards at least once in each year.

Mr. HENRY. My point in asking that was this: This same model law provides for the certification of those primaries only once in 10 years; and would it be wise to take those out and use them once a year to calibrate our secondaries and only have them certified by the bureau once in 10 years?

Mr. HOLBROOK. I think it very necessary to test the office standards at least once a year. The reason why we have the State standards used as little as possible is that we realize that if they are used very often they will change somewhat in weight. Now, these office standards are going to be used in all the tests in the office during the period of a year, and at the end of that year it seems to me it would be absolutely necessary to check these office standards with the State standards to see that there had been no variation between them. As to the other point, I do not think that the use of the State standards once a year or 10 times between certifications can be called at all excessive. I think they might be used very much oftener than that, and still show no appreciable change.

Mr. HENRY. Well, from the nature of the thing, being gold plated, there was a question in my mind; but if you are satisfied, I am.

Mr. HOLBROOK. I think Dr. Stratton will be able to tell you that even a gold-plated weight can be used with perfect safety 10 times without any appreciable change.

Dr. STRATTON. I think Mr. Holbrook has got exactly the right answer to that. If the weights will not stand being used 10 times, you ought to get a new design—a new weight.

Mr. GOODWIN. I would like to ask Mr. Holbrook if that means that the State standards shall be corrected each and every year.

Mr. HOLBROOK. No; the State standards are to be calibrated once in 10 years by the National Bureau of Standards. The standards which are to be tested once each year are the office standards—by the State standards.

Mr. GOODWIN. Well, I object to that, because I am afraid that will bring confusion in the States, for the reason that in our State the expense of this business has to be paid by the towns and cities.

Mr. HOLBROOK. Just a minute, Mr. Goodwin. Both you and Mr. Cluett seem to be laboring under a false impression. These standards which we are specifying shall be tested and sealed are standards belonging to the State and used by the State inspectors. The section does not refer to county or city standards at all. That is already covered by another section of the law. We have a set of State standards and State inspectors who are busy using other sets of standards in their own work throughout the State, and these secondary State standards—which will be returned to the office of the superintendent of weights and measures from time to time as the inspectors come in and make their reports, etc.—are to be tested once in each year. This section has no reference to county and city standards at all. I will ask Mr. Cluett if that explanation, that these are State weights and measures, clears up his difficulty?

Mr. CLUETT. Yes, sir.

Dr. STRATTON. Mr. Holbrook, probably it will help these gentlemen a little to state that that is exactly the policy we pursue here. If you send in your State standards, they are not compared with our international or primary standards, but we have certain working standards that have been compared with those primary standards, and those are the ones that we use. You can readily see that if we did not do that there would be danger of injuring the primaries. It is merely to save your fundamental State standards from too much use.

Mr. CLARK. I notice by our laws that our standards are supposed to be tested by the Bureau of Standards once in five years. I want to know if that was changed in your law.

Mr. HOLBROOK. That is really a minor point—once in 5 or once in 10 years. We believe that with this provision the State standards will be protected from excessive use, and that it will be sufficient to return them to the bureau once in 10 years. It is very often rather an expensive proceeding, and there is always some danger of their being lost or damaged; and it is considered that if they are satisfactory weights and measures they will keep their adjustment for 10 years.

Mr. CLARK. Probably ours will, because we have no outside sealing to do. We do all our work in the office, and our work is simply comparing the city and town standards. We do not do any sealing; so that our primary standards will not get the work or wear that perhaps Mr. Henry's would.

The ACTING CHAIRMAN. Are there any other remarks, gentlemen? If not, a motion is in order to adopt section 2.

Mr. METCALF. I move that the section be adopted as read.

(The motion was seconded and the section was adopted.)

Mr. HOLBROOK. The next section which I will read I have called the net-weight section proposed for the model law. A little explanation may be necessary, although very little. It simply provides that all commodities shall be sold by net weight. Now, under the laws of this country it has always been considered, when weights and measures were talked about, that net weights and measures were being referred to. When you buy a commodity you expect to get what you order of the commodity itself, without wrappings or other coverings. Well, the custom has been in certain trades to sell commodities by gross weight, in which case the man who could put the most wrappings on his package was the most fortunate man; because it is impossible in buying a package to know how much the wrappings on it weigh, and if I can put 10 pounds upon my package, or bale of hay, or whatever it is, and another man can get 20 pounds on his, he can subject me to very unfair competition. Some companies have endeavored to get around the sections of the State laws so far, which undoubtedly refer to net weight, many of them by stamping upon their invoices or their bills a statement to the effect that various commodities are sold by gross weight, including the weight of the wrappings.

Now, it seems to me that even though they stamp this fact upon their bills, the retailer receives no protection, because in no case is he able to sell these various wrappings to the consumer as the product which he bought; and if he endeavors to include that amount of wrapping in his sales, he will very soon, to use a slang expression, be "jacked up" by the inspectors of weights and measures. And the retailer can not adopt the scheme of the wholesaler since he will find it impossible in most cases to make a separate statement to each customer that he is selling commodities by gross weight. The wholesale companies, as I say, will put it on their statements, but the man who sells over the counter—the retailer—is not able to make that statement. Therefore the retailer buys a large number of pounds of various kinds of useless wrappings which he is not allowed to sell.

Now, I desire to put this section in for this purpose—that although net weight is understood, yet it has been held that when that statement is upon the invoice or bill you are unable to proceed against the packer or whoever it may be. Now, if we make this a section of the model law, providing that commodities shall be sold by net weight, then, if you please, the packer will be unable any longer to stamp upon his bills the fact that he is selling by gross weight and get around the law, because it is well known that when a State in the exercise of its police power passes a law providing a penalty for doing a certain thing and thus making the act unlawful, no person is able by special agreement to nullify that law. The special agreement will be nugatory on the ground that it is contrary to a specific statutory provision. Therefore, if this section is adopted, the packers and various other people who now sell their commodities by gross weight will no longer be able, by putting a statement to that effect on their bills, to sell by gross weight, since the contract

will be held illegal as being against the policy of the State as expressed by the statutes of the State.

Mr. WOOLLEY. Mr. Holbrook, am I to understand that it is your opinion that the regulations of a trust or a combine—the making of rules by them in the selling of their goods by printing on the bottom of their bill, as Mr. Cluett has said, in letters impossible to read—supersede National or State laws?

Mr. HOLBROOK. No.

Mr. WOOLLEY (continuing). And that we can not win a case of that kind in court?

Mr. HOLBROOK. No; my point was just the opposite.

Mr. WOOLLEY. As it is now, I mean?

Mr. HOLBROOK. As it is now, with net weight not specified? I think so, possibly.

Mr. WOOLLEY. We have that in Massachusetts.

Mr. HOLBROOK. This section which I am going to read is very similar to your section in Massachusetts. I believe that if your section specifies distinctly that a commodity shall be sold by net weight, and there is no special contract provision in the law—a provision which has done more harm than almost any other phrase which could be added—then the packers will be unable to make a special contract with the retailer, by printed statement or otherwise, to sell in any other way than by net weight. They must sell by net weight, and any statement on their bills contrary to the express statutory provision will be nugatory.

Mr WOOLLEY. What I am getting at is this: I want to understand from you and the officers of this association if these combines are really greater than their maker. It seems to me that as we have a national law, and also as we have in Massachusetts this net weight law, we ought to be encouraged to prosecute, which I intend to do as soon as I get home. I have a case that I am going to make a test case of, and I want to be encouraged somewhat; and I hope we will win, even though they do print their rules and regulations on the bottom of their bills.

Mr. HOLBROOK. It is my personal opinion that the Massachusetts section as approved in 1913, requiring goods to be sold by net weight, will absolutely prohibit packers or others from selling by gross weight. I do not believe that they will be able to make a contract of that sort, no matter how clearly they specify what they want, because that would be held by the courts to be an illegal contract.

Mr. WOOLLEY. That is right.

Mr. HOLBROOK. And if a merchant so desired, he could order a bill of goods from a packing company and they could make this provision that these goods should be sold by gross weight, and he could accept the goods and pay for them, for instance, by a promissory note, and when that note fell due he could defend on the ground that the note was given as a consideration for a contract that was illegal. The courts have held in a number of cases that inasmuch as such a contract is void, he would not be obliged to pay that note, since the note would also be void; neither would he be obliged to return what he received in consideration of that contract if this

had been disposed of. So I think that if that was better known—the fact that a person can at his pleasure pay or not pay for the goods sold by gross weight, when the law requires that they shall be sold by net weight—that the practice of selling by gross weight would soon die out.

Mr. WOOLLEY. Mr. President, I wanted you all to understand that I am in favor of this section being adopted, and I believe it would be contributory ammunition to the cause of honest weights and measures.

Mr. MONTGOMERY. Mr. Chairman, I move the adoption of the section as read.

Mr. GOODWIN. I second the motion.

Mr. HOLBROOK. I have not read the section as yet. [Reading:]

Whenever any commodity is sold on a basis of weight, it shall be unlawful to employ any other weight in such sale than the net weight of the commodity; and all contracts concerning goods sold on a basis of weight shall be understood and construed accordingly. Whenever the weight of a commodity is mentioned in this act it shall be understood to mean the net weight of the commodity.

Mr. CLUETT. Mr. President, would that prevent the packer from selling by numbers? Could he not still sell a No. 1, No. 3, or No. 5 can of lard?

Mr. HOLBROOK. I believe so; except that under the provisions of a section which I have already read he would be obliged to label the contents on the outside of the can. Under this section he might sell a hundred pounds of bacon by saying "one lot of bacon," for instance, for such a sale would make no pretense of being "on a basis of weight," but no one would purchase "one lot of bacon." The original package goods in which the question might come up are already covered in another section.

Mr. MONTGOMERY. I now renew my motion, Mr. Chairman.

The ACTING CHAIRMAN. The motion has been seconded. Are there any remarks?

(The question was taken and the section was adopted.)

Mr. HOLBROOK. The next is a proposed section relating to the sale of butter in prints and bricks. I select butter especially out of a large number of commodities, and amend, if you please, our net weight section slightly in regard to the sale of such butter. I am standardizing in this section the sizes of the prints in which butter may be sold.

Butter is a commodity which has universally been sold by the pound throughout the country in brick form—the pound or the half pound. Certain butter sections have been passed which require that the net weight shall be stamped on the outside of butter containers; and under this law a large number of concerns, especially in the West, have been putting out and labeling a package of butter as containing fifteen ounces of butter. I have had a wide experience with these laws, and I find, even where that net weight law is absolutely enforced—enforced just as strictly as it can be—that where these 15-ounce prints are sold, even so labeled, the consumer in nearly every case believes that he is getting a pound of butter; because he goes in and asks for a pound of butter, and regardless of the marking on the package it is delivered to him by the retailer as a pound.

I have discussed this matter with a number of retailers, and they state that it is never possible for them to sell butter in a print containing about a pound except as a pound of butter; because the consumer demands a pound, and if they were obliged to stop in every case and state that the package which they were about to deliver weighed only 15 ounces, it would delay their business and spoil their sale, because as soon as that information was actually given to the purchaser, he would no longer be willing to purchase that butter.

For that reason I believe that the time has come when some certain commodities should be regulated to a greater extent than by requiring the net weight to be marked upon the label, and I believe that butter is one of the most important commodities with which to begin in requiring them to pack in specified sizes only.

With that explanation I will read the proposed section:

It shall be unlawful for any person to sell or offer to sell any butter in any other manner than by weight. It shall be unlawful for any person to put up, pack, or keep for the purpose of sale, offer or expose for sale, or sell any butter in the form of prints, bricks, or rolls in any other than the following sizes, to wit: One-quarter pound, one-half pound, 1 pound, 1½ pounds, or multiples of 1 pound. Each print, brick, or roll shall bear a definite, plain, and conspicuous statement of its true net weight, on the principal label, where there be such a label, otherwise on the outside wrapper thereof; such statement shall be in gothic type not less than one-quarter inch square. The prints, bricks, or rolls referred to in this section shall be construed to include those prints, bricks, or rolls put up by the manufacturer or producer; or, when put up prior to the order of the commodity, by the vendor.

Let me explain the reason for marking in that particular kind of type. I have traveled all over the country, as most of you know; I have seen the enforcement of many laws and ordinances. This requirement of gothic type one-quarter inch square is required by ordinance and is used in the city of Denver, and in that city butter is more uniformly and conspicuously marked than in any other section of the country which I have visited. This is an excellent size, which is readily adaptable to butter prints without much modification of existing labels, and it is also in a very plain letter; and the consumer actually knows in those cases what he is receiving.

Mr. GOODWIN. Mr President, I do not like the word "producer." A great many farmers make butter and carry it to market. Now, they have no means, practically speaking, of complying with the requirements of this law. I can not see why that is not going to be a hardship upon that class of people, and I would like to have the word "producer" stricken from that section.

Mr. HOLBROOK. In regard to Mr. Goodwin's objection, I would say that there is no reason in the world why a farmer should be allowed to deliver short-weight dairy butter when the creameries are obliged to deliver full-weight creamery butter. It will be the simplest thing in the world to mark this product, and it is done at the present time in some sections of the West. The farmers are obliged to—or do in most cases—wrap their butter up in paraffin paper. It costs practically nothing to have that paper printed in accordance with the requirements of this section. If they do not desire to have it printed it will be just as easy to buy a rubber stamp with quarter-inch gothic letters and mark their butter as required by this section.

Mr. GOODWIN. Mr. Chairman, I agree with the gentleman; I think that that is practical.

Mr. CLUETT. Might it not be well to include oleomargarine as well as butter?

Mr. HOLBROOK. I think that would be a good amendment and I am willing to accept it.

The ACTING CHAIRMAN. Do you make that as a motion, Mr. Cluett?

Mr. CLUETT. Yes.

Mr. WOOLLEY. I second that motion.

Mr. HENRY. Mr. Chairman, I want to suggest to Mr. Holbrook if it would not be well to include, with oleomargarine, butterine and renovated butter.

Mr. HOLBROOK. I think that butter and oleomargarine is a sufficiently inclusive wording. I think that process butter is included in the term "butter"—that renovated butter is also included.

Mr. HENRY. Is there not a distinction made in some of the States in their pure-food laws? For instance, in New Hampshire—I am not absolutely certain about this, but I am pretty certain—if a merchant sells renovated butter as butter, pure and simple, he is liable to a heavy penalty.

Mr. HOLBROOK. If there is any doubt that renovated butter and process butter are included in the section as it stands, I am perfectly willing to add them, because it was intended that they should be included.

Mr. WOOLEY. Mr. Chairman, is it not to be understood that renovated butter is butter; that butter is included, renovated or otherwise?

Mr. HENRY. For information I want to restate that proposition in New Hampshire as I understand it. That is, by law renovated butter is not butter pure and simple. The law says that renovated butter is not butter. If the law says so, it is not; and that might cause confusion in some States like New Hampshire, that have such a law.

The ACTING CHAIRMAN. Now, in reference to process butter. Would you insert that also, Mr. Cluett?

Mr. CLUETT. I really think that is covered by the term "butter" myself. If it is the opinion of the members here that it is not, I am willing to accept any amendment.

Mr. HOLBROOK. There is no objection to the amendment that I can see. As I have stated, it would be better to include a few useless words than to find out later that we have not included all we intended to.

Mr. NEALE. Mr. Holbrook, what is in the pure food and drugs act at the present time regarding oleomargarine and the marking thereof? You told me something about that once out West. Is it required to be marked at the present time "oleomargarine"?

The ACTING CHAIRMAN. It is in New Jersey.

Mr. NEALE. I do not think there is any requirement that it shall be marked as to its weight. Is that a matter of State regulation or national regulation?

The ACTING CHAIRMAN. State.

Mr. HOLBROOK. I do not think there has been any provision in the pure-food law requiring oleomargarine to be marked with its weight until the passage of the amendment which we have discussed. And even now that there is such a provision in the Federal law, it is advisable to include it in the State law also, in order to give the State and city sealers of weights and measures concurrent jurisdiction with the pure-food inspectors in enforcing the provisions, and also to include intrastate shipments. Let me suggest as to the wording that if you will leave it to us we can include oleomargarine and process and renovated butter in the section without any difficulty.

The SECRETARY. I think probably there are some decisions on that point already, as to what is meant by "butter," so that I think we can amend that in such a way that it will be looked out for and be in conformity with any national practice.

The ACTING CHAIRMAN. As I understand it, you accept the amendment offered by Mr. Cluett?

Mr. HOLBROOK. Yes.

The ACTING CHAIRMAN. Are there any other remarks, gentlemen, on section 4 as amended by Mr. Cluett to include process butter and oleomargarine?

(The question was taken and the section was adopted.)

Mr. MONTGOMERY. Mr. Chairman, I would like to ask Mr. Holbrook a question. Does this section regulate the sale of butter that is brought to town by the small farmer, probably once a week, incidentally, with potatoes and other things?

Mr. HOLBROOK. Yes, sir.

Mr. MONTGOMERY. Where the housewife prepares three or four rolls of butter, with possibly two or three or as much as 5 pounds in a roll, in these small country towns?

Mr. HOLBROOK. Yes. He is allowed to put that up in pounds, half pounds, quarter pounds, one and a half pounds, or any multiple of one pound.

The ACTING CHAIRMAN. And use a rubber stamp for the marking if necessary.

Mr. NEALE. May I ask if he could sell it by the jar?

Mr. HOLBROOK. That would not be covered under this section. This section refers to prints, bricks, or rolls.

Mr. MONTGOMERY. It seems to me, Mr. Chairman, that it would work a hardship on these small farmers, who do not have any scales or any way to regulate the weight of their butter, to make the housewives, especially back in the hills of West Virginia, put up their butter in 5 or 10 pound boxes and bring it to the stores. The housewives back in our country simply put into a roll whatever their churning makes, and bring it to the country store.

Mr. HOLBROOK. In a container—in a box, for instance?

Mr. MONTGOMERY. Yes.

Mr. HOLBROOK. Well, if it is in a box, our net-contents-of-container section has already covered that matter. It would have to be stamped with its weight, anyhow. I think it is necessary. There is no reason why the creamery company should be required to sell full weight, or sell in certain sizes, when the farmer is not required to do

so. The farmer, if necessary, could bring his butter in, if he did not have a scale—and I think most farmers have some kind of a scale, although I will defer to you in that matter as regards West Virginia—and before selling it he could weigh it on the scale of the merchant to whom he was selling it, and mark it at that time. If he marks it before sale, that is all that is necessary. The weighing, of course, would be required to be done anyway, and the marking would simply follow as a matter of course.

Mr. MONTGOMERY. He has got to mark it in a peculiar way. He must have a certain stamp, must he not?

Mr. HOLBROOK. He must mark it in letters at least one-quarter of an inch square.

Mr. GOODWIN. Mr. Holbrook, may I ask you if a common pencil mark would be sufficient to designate the net weight of that butter?

Mr. HOLBROOK. I think not; not the way the section is worded. It should be printed or stamped with a rubber stamp.

Mr. GOODWIN. You do not say so, do you?

Mr. HOLBROOK. Yes; it says "Gothic type."

Mr. GOODWIN. I think it is going to create a hardship upon these producers who bring in small quantities.

Mr. HOLBROOK. The stamp can be purchased for almost nothing, and can be kept either by the farmer himself or by the grocer who takes in a large amount of butter from the farmers. I do not think there would be any difficulty in enforcing the section, as long as a rubber stamp in those cases will cover the matter.

Mr. GOODWIN. Mr. Chairman, I believe there are some sections of this country where it would be almost impossible for a farmer to get a rubber stamp; he might not be able to get one within a hundred miles of where he lived, and I think that is going to cause a hardship to the farmer—to the producer.

Mr. HOLBROOK. I would call to your attention, Mr. Goodwin, that if this is not sold in the form of a print, brick, or roll—all these words have very definite meanings—it would not have to be marked under this section, but would have to be marked under a section that we have already considered—the net-container section; and this particular style of type here is used only when it is sold in prints, bricks, or rolls. It does not include a wooden container, but includes merely some kind of a paraffin wrapper or cardboard box, which, as I have already stated, could be printed at practically no expense whatever.

Mr. GOODWIN. Then, as I understand the subject, the farmer or producer can bring this butter to market and sell it in a lump of a designated quantity without any printing being required?

Mr. HOLBROOK. No.

Mr. RICHARDSON. Mr. Holbrook, in the country a great many small farmers that make butter in small quantities pack it in what is known as a firkin, made to hold about 25 pounds, I think, as a rule. If they send that firkin in to market and sell it, would they have to stamp "25 pounds" on it?

Mr. HOLBROOK. Not under the provisions of this section. This section refers only to butter in prints, bricks, or rolls; but under the

provisions of the net-contents-of-container section he would be obliged to stamp that firkin with its net weight.

Mr. RICHARDSON. Before he could sell it?

Mr. HOLBROOK. That is right. But I would suggest again that that is not under the provisions of this section; it is under the provisions of the section that we have already considered.

Mr. FERNER. I would like to ask one question. Would the stamping of the weight into the butter with the die that makes the print be permissible?

Mr. HOLBROOK. It states that it must be on the principal label, where there is such a label; otherwise on the outside wrapper thereof. Stamping the weight of the butter in the butter itself would be unsatisfactory, I believe.

The ACTING CHAIRMAN. The section is already adopted, gentlemen.

Mr. HOLBROOK. The next section which I will read I will call the proposed section for the model law relating to the marking of certain textiles.

In framing the net-contents-of-container provision it seemed almost impossible to include in that section various things such as spools of thread, balls of twine, bolts of cloth, etc., since in some cases these may not, strictly speaking, be considered packages since they are not put up in receptacles as required in the definition of "package" contained in that section. Therefore, inasmuch as we believe that textiles—thread, silk, cotton, etc.—should be marked, I have taken this matter up in a special section which is in the nature of a net-centents-of-container section for these commodities. I will read this section.

It shall be unlawful to keep for the purpose of sale, offer or expose for sale, or sell any commodity composed in whole or in part of cotton, wool, linen, or silk, or any other textile material on a spool or similar holder, or in a container or band, or in a bolt or roll, or in a ball, coil, or skein, or in any similar manner, unless the net amount of the commodity in terms of weight or measure shall be definitely, plainly, and conspicuously marked on the principal label, if there be such a label; otherwise on a wrapper, band, or tag attached thereto. The words "spool or similar holder, container or band, bolt or roll, or ball, coil, or skein" shall be construed to include the spool or similar holder, container or band, bolt or roll, or ball, coil, or skein put up by the manufacturer; or when put up prior to the order of the commodity by the vendor. It shall be held to include both the wholesale and the retail package.

Mr. CLUETT. Mr. President, as I understand it, the net-weight bill now takes in only foods. Am I right in that?

Mr. HOLBROOK. That is the national law; yes.

Mr. CLUETT. Now, since we are getting away from food and getting down to something that is neither, why not make a change in there and say "All articles put up in package form"—tacks, toothpicks, and everything else?

Mr. HOLBROOK. We have already done that; but the difficulty is that these are put up in a peculiar way. For instance, a ball of twine is usually not in a receptacle. So we have worded this section in order to cover things which it did not seem possible to cover in that general section, this merely being a section which enlarges the provisions of the net-contents-of-container section. We have covered all commodities which are put up in package form, according to our definition, in

the other section; but a package might not be held to include a ball of twine, for instance. It might not be held to include a spool of thread, because a spool is a holder rather than a receptacle. I was impressed by this difficulty, and finally decided that if we took care of these special commodities, which we do not seem to be able to specify in that section with exactness, in a special section, that would cover the matter in a satisfactory manner.

Mr. CLARK. I would like to ask if that applies to the marking of spools of thread by length?

Mr. HOLBROOK. It requires spools of thread to be marked in either way—by weight or measure.

The ACTING CHAIRMAN. Motions are in order to adopt this section.

Mr. WOOLLEY. Mr. Chairman, I move that this section be adopted.

Mr. GOODWIN. I second the motion.

Mr. CLARK. I do not like to interrupt; but it seems to me that ribbons are not included.

Mr. HOLBROOK. Ribbons would be included, in my opinion.

Mr. CLARK. They are sold by the yard. I thought you said it applied to weight only.

Mr. HOLBROOK. No. The wording is, "unless the net amount of the commodity in terms of weight or measure shall be definitely stated."

(The question was taken and the section was adopted.)

Mr. HOLBROOK. The next section relates to the manner of sale of berries and small fruits. I do not think it is necessary to make any explanation of this section at all. I will read it:

It shall be unlawful to sell or offer to sell any berries or small fruits in any other manner than by weight, dry measure, or in the containers described in this section. It shall be unlawful to procure or keep for the purpose of sale, offer or expose for sale, sell, or give away baskets or other open containers for berries or small fruits, holding one quart or less, or to procure or keep for the purpose of sale, offer or expose for sale, or sell berries or small fruits in baskets or other open containers, holding one quart or less, of any other than the following capacities, when level full: One quart, one pint, or one-half pint, standard dry measure.

Mr. CLUETT. Would it not be well to insert in there the word "fresh"—fresh berries? That would include all—fresh fruits as well as dry fruits.

Mr. HOLBROOK. It includes all. It says, "berries or small fruits" shall be sold "by weight, dry measure, or in the containers described in this section."

Mr. CLUETT. All right.

Mr. MONTGOMERY. Mr. Chairman, I move the adoption of the section as read.

Mr. HOLBROOK. If I might interrupt there just a minute, I have worded two sections in this regard, one of which covers berry or small-fruit baskets in sizes of 1 quart or less, and the other covering them in all sizes. Now, there might be some discussion as to whether you want to regulate all baskets for berries and small fruits—that is, not limit the sizes. I will read the other section. The first sentence is the same. The remainder of the section is as follows:

It shall be unlawful to procure or keep for the purpose or sale, offer or expose for sale, sell, or give away baskets or other open containers for berries or small fruits, or

to procure or keep for the purpose of sale, offer or expose for sale, or sell berries or small fruits in baskets or other open containers, of any other than the following capacities, when level full: One quart, one pint, or one-half pint, standard dry measure, or sizes obtained by successively multiplying the standard dry quart by two.

One regulates baskets holding 1 quart or less, and ignores other baskets, although I believe berries or small fruits are seldom sold in baskets larger than 1 quart. The other provides for those sizes and the sizes obtained by successively multiplying the standard dry quart by 2, which would include 2, 4, 8, etc.

Mr. NEALE. Mr. Holbrook, inasmuch as this convention yesterday indorsed, or rather put over, a very sweeping suggestion of selling by weight rather than by measure, this becomes, then, a special case of measure.

Mr. HOLBROOK. Yes. I think that even in those States (such as Ohio and Massachusetts) where they require vegetables, etc., to be sold by weight, there is an exemption in favor of small fruits being sold by the basket, inasmuch as these commodities are very difficult to handle without destroying the product. Is not that true, Mr. Woolley?

Mr. WOOLLEY. Yes.

Mr. MONTGOMERY. I now renew my motion, Mr. Chairman.

Mr. HOLBROOK. The question is, to which section do you refer—do you prefer to regulate baskets holding 1 quart or less, or baskets of all sizes; that is, requiring them to be in multiples of the dry quart—2, 4, 8, and 16.

The ACTING CHAIRMAN. How about peaches?

Mr. HOLBROOK. I do not believe peaches and plums are included under the term "berries or small fruits."

The SECRETARY. I think they are generally included by dealers. I think they have plums certainly as small fruit. That question came up in Congress in connection with grapes, and they continually referred to peaches and plums as small fruit. That seemed to be the impression of the gentlemen who represented the produce exchanges, etc., and that is what they had intended to cover.

Mr. NEALE. Mr. Chairman, when the recent law passed in Minnesota, covering the subject—which was worked over pretty carefully by Dr. Reichmann, Mr. Emery and myself last fall together—was put up to our people they thought "all berries and small fruits" was indefinite and would lead to all kinds of trouble in court; and the lawyer who framed the law defined the kinds of fruit and berries—strawberries, blackberries, etc., plums, quinces, and small fruits of that character. He thought that to define what kinds were meant would do away with the question of what is a small fruit. Do you think, Mr. Holbrook, that it would make it too bulky to name the berries and small fruits that you refer to? I believe it would strengthen it to make it specific.

Mr. HOLBROOK. As a general proposition, Mr. Neale, I do not like the specific section, because when you have a specific section an omission of a certain commodity is fatal as far as that commodity is concerned. For instance, you might omit something that ought to be covered, and it would than require a special amendment to cover it.

I think the Century Dictionary has a specific definition of the term "berries and small fruits." I will look this up.

Mr. CLARK. Mr. Chairman, I wanted to offer a suggestion in regard to those baskets of a larger size than the quart. It would not affect us in Massachusetts, because we have a law there which says that fruits and vegetables for which a legal weight has been established shall be sold only by weight; but if we had not that law, we have found in the past that the peddlers would go around selling a peck of peaches, for instance, and they would only hold six quarts to a basket. Now, it seems that in the States where they have a law enabling them to do that, it would be well for all baskets over the size of one quart, for instance, to be marked as to their contents—either 2, 4, 6, or 8 quarts—so that the party purchasing would know what he was buying.

Mr. HOLBROOK. I think, perhaps, in view of the fact that the conference has gone strongly on record as being in favor of the sale of all these commodities by weight—not these commodities particularly, but all commodities by weight wherever possible—that it might be advisable to pass a section which simply standardizes the quart, pint, and half-pint baskets, and stop there, so that when they sell berries in larger amounts than one quart we recommend that they be obliged to sell them by weight—that is, just standardize the quart, pint, and half-pint boxes, thus making a special exception in that case—because I think we all recognize that it will not be feasible to sell berries and small fruits by weight in these small amounts. Raspberries would be in very poor condition, I think, after they had been weighed out once or twice, and it would be unfair to the purchaser. That is an exemption that is made in every State so far as it requires berries to be sold by weight. I think all of them have a berry-box provision allowing these things to be sold in these quart, pint, or half-pint boxes.

Mr. NEALE. As I understand it, you are now deferring action on these two last proposed amendments pending that definition?

Mr. HOLBROOK. Yes; we might decide, pending that, if it is the wish of the conference, simply to use the section referring to quarts and smaller baskets, and then we can decide on the other point afterwards. What do you think about that, Mr. Fischer?

The SECRETARY. I think that is all right.

Mr. MONTGOMERY. Mr. Chairman, I would like to ask Mr. Holbrook a question. Do we have a section that regulates the sale of peaches, apples, and pears in bulks—that is, in half-bushel or bushel baskets, or barrels?

Mr. HOLBROOK. No specific section; no.

Mr. MONTGOMERY. That is becoming a great industry in West Virginia. We are putting in great peach orchards and apple orchards down there. They send what they claim to be half-bushel and bushel baskets to the consumers in West Virginia, and then they ship their apples, peaches and pears out in barrels to every State.

Mr. HOLBROOK. Yes, sir; but consider that the conference should be consistent. Now, yesterday we said that it was the sense of this conference that all these things should be sold by weight. Now, if to-day we pass another section regulating the size of baskets in which those things are sold, we rather go back on our action of yesterday; and the reason I am introducing this berry-box section at all is that these small packages of berries should be exception to the sentiment expressed yesterday, and I think the conference so agrees.

I now have the Century Dictionary definition of the word "berry." I am rather sorry I started this. [Reading:]

Berry. Technically, a simple fruit in which the entire pericarp is fleshy, excepting the outer skin or epicarp, as the banana, tomato, grape, currant, etc.

That does not mean much to me. That is the technical definition. Here is another definition given.

In ordinary use, any small pulpy fruit, as the huckleberry, strawberry, blackberry, mulberry, checkerberry, etc., of which only the first is a berry in the technical sense.

Now, I am no easier with the Century Dictionary before me than I was before. It was a matter of recollection with me that there was a specific definition there of the whole phrase "berries and small fruits," but I do not find it. So it is merely a question of what you desire to do as to defining—whether you will leave it "berries and small fruits." I would say that the section is adopted in that way in a great many States, and they do not seem to have any trouble in enforcing the law; but if you want to define berries and small fruits specifically some wording should be suggested.

Mr. NEALE. Mr. President, having just come out of the battle, which was fought over pretty thoroughly two or three months ago, let me say that our lawyers there figured that to specify eight or ten kinds of berries and fruits—plums, cherries, quinces, apricots, etc.—would be much safer in court, because, although it seems remarkable, sometimes you can not say what is a berry and what is not a berry unless it is specified for you. If we can not define it here, with the aid of Mr. Holbrook and his celebrated dictionary, how is the man in the field going to define it? I would be in favor of specifying if possible.

Mr. HOLBROOK. It is a fruit in which the entire pericarp is fleshy excepting the epicarp, or something like that; but a specific wording would have to be suggested. We have used "berries and small fruits." If it is the sense of the convention to specify these things, I think you might leave it in my hands and I will look up all the berries and all the small fruits and include them in the section.

Mr. CLARK. Mr. Chairman, we have specified various berries in this way: "Strawberries, blackberries, cherries, currants, gooseberries, raspberries, and berries of a similar nature."

Mr. HOLBROOK. Mr. Neale has objected to "berries of a similar nature," since it is difficult to tell how similar a thing is. I do not know whether that is a very strong objection or not.

Mr. NEALE. We have it in our law.

The ACTING CHAIRMAN. In New Jersey it is "berries and small fruits."

The SECRETARY. Mr. Chairman, has there ever been any question as to what was meant by that?

The ACTING CHAIRMAN. My interpretation is that it includes apricots, peaches——

The SECRETARY. But I mean has there been any question as to the interpretation? Now, I got the impression that berries and small fruits meant a very definite thing. All these gentlemen that appeared in favor of this bill in Congress never raised the question as to what

was included. Of course, they may not have been quite as thorough as we are. They simply talked as though berries and small fruits were definite things, and that everybody understood exactly what was meant by that phrase. But to show how doubtful that was, of course I myself got the impression that it included plums and peaches.

Mr. NEALE. How about small pears?

The SECRETARY. Perhaps small pears; that would certainly be small fruit.

Mr. NEALE. How about ordinary pears—normal-sized pears?

The SECRETARY. They are not generally sold in quart boxes.

Mr. RADCLIFFE. Mr. Chairman, in Ohio we speak of "berries and small fruits." We do not include apples and peaches. We have provided that apples, peaches, tomatoes, and all those things shall be sold by weight, and when we speak of berries and small fruits we mean berries like the strawberry, raspberry, blackberry, and berries like that—small berries.

Mr. HOLBROOK. I will send for another volume of the Century Dictionary. I am positive that somewhere I have run across an exact definition of berries and small fruits as used in the produce trade; but where I found it I do not know.

The SECRETARY. Mr. Chairman, would not the whole thing be settled if we were to adopt this section as proposed by Mr. Holbrook, and then include in it a definition of what we meant, which he might supply later? Is not that a feasible suggestion, Mr. Holbrook?

Mr. HOLBROOK. That would be perfectly feasible. The question merely revolves around whether you want to make that specific or whether you want to leave it general. In most States it is left general, and I do not believe there would be any difficulty with a general section of that character. But if you want to be specific, of course it is a very easy matter to leave it with us to simply include, as I said, in the definition of berries and small fruits, all the berries and small fruits we can find.

Mr. METCALF. What would be the objection to making it specific?

Mr. HOLBROOK. The objection to making anything specific is that an omission is fatal—that is, a general wording covers everything you want to include, but just as soon as you make the wording specific you are bound to leave out some important thing and your law is inoperative in regard to that particular thing. That is the only objection to it.

The SECRETARY. Mr. Chairman, I do not want it understood that I am in favor of making the thing specific at all, but I understood that that was the general sense of the meeting, and I merely mentioned that in case it was. I quite agree with Mr. Holbrook that it is perfectly safe to leave it general; but there has been a good deal of argument against that, and I merely suggested the other in case that was not the sense of the meeting.

Mr. NEALE. Mr. President, perhaps I was making all the noise there was against it, and inasmuch as I yield to people who know as much as or more than I do about it, I move now that we accept the proposed section as read by Mr. Holbrook.

Mr. CLUETT. Could that be covered by saying "all fresh berries or fruits of a less diameter or dimension than"—specifying a size? Then you would not have to specify each one.

Mr. HOLBROOK. Inasmuch as we have limited these things to the quart, pint, and half-pint, it seems to me that there is not going to be much trouble. Very few apples or other large fruits are sold by the quart anyhow; they are sold in larger-sized packages.

Mr. WOOLLEY. Mr. Chairman, I believe, in view of the fact that my friend on the right (Mr. Neale) has yielded, we can go ahead and adopt this section. The purpose is to avoid the difficulty of selling these fragile berries by weight, and I believe that this will serve the purpose.

The ACTING CHAIRMAN. You made the motion, Mr. Neale?

Mr. WOOLLEY. I am in favor of the motion.

Mr. NEALE. I now remember there were two berry-box propositions. Which one did you settle on?

Mr. HOLBROOK. I believe it was decided that we standardize the quart and smaller baskets only.

Mr. NEALE. What did you propose to do with the multiples?

Mr. HOLBROOK. In view of the fact that yesterday we decided that all products should be sold by weight, we decided to limit the exceptions to the quart, pint, and half-pint boxes, and recommended that the others—in accordance with our action of yesterday—be sold by weight, inasmuch as by making such a large exception as standardizing baskets of all sizes, you would practically rescind your resolution of yesterday.

Mr. NEALE. I understand, Mr. President. I stand on the motion.

(The motion was seconded and the section was adopted.)

Mr. HOLBROOK. We have framed a section standardizing the barrel for fruits, vegetables, and produce; and once again I think we will have no difficulty, because the conference, if they want to be consistent, should stand by their action of yesterday, by which, if I am not mistaken, the Tuttle bill was indorsed. Is not that correct, Mr. Fischer?

The SECRETARY. Yes.

Mr. HOLBROOK. Then the size of the barrel desired has already been fixed by the conference, and this section should conform substantially with the provisions of that bill. There is a question in my mind about the smaller packages than the barrel. I have the section as far as the barrel itself is concerned all ready. I will read it:

> The standard barrel for fruits, vegetables, and produce shall be of the following dimensions when measured without distension of its parts: Diameter of head inside of staves, 17⅛ inches; distance between heads, inside measurement, 26 inches; the outside bilge or circumference not less than 64 inches; and the thickness of staves not more than four-tenths of an inch: *Provided*, That any barrel of a different form having the same distance between heads and a capacity of 7,056 cubic inches shall be a standard barrel. It shall be unlawful for any person to offer or expose for sale or sell any other barrel for fruits, vegetables, or produce, or any fruits, vegetables, or produce in other barrels than the standard barrel as defined in this section, or the subdivision thereof known as the half barrel.

Now, that last clause seems to me to be a defect in the Tuttle bill, inasmuch as they have first, with very great particularity, stated the size and shape of the barrel, and then seem to have thrown in their

half barrel afterwards without very much consideration. The half barrel, providing it holds half of 7,056 cubic inches, might be, so far as the law is concerned, of any shape whatever. It might be flat; it might be tall. They have considered it necessary to specify with some degree of exactness the dimensions, and consequently the shape of the barrel, and yet no one can be sure what form a half barrel would take under that law.

The SECRETARY. The fact of the matter is that the people who are behind that law are, of course, more interested in the barrel than any thing else. They want a barrel, and they had not thought very much about half barrels. But it does seem to me that the question which Mr. Holbrook has raised—and which has been raised before, of course—ought to be settled. If we are going to specify the dimensions of the barrel and also permit a half barrel we ought to specify that very clearly.

While I am on my feet I would also like to explain why I think a barrel is necessary. Although it seems to be a contradiction of our action yesterday, declaring that everything shall be sold by weight, we all know that there is a tremendous business in barrels—for instance, in apples sold by the barrel. You can not determine the weight of them; I mean it is an impracticable proposition. The farmer puts up his crop of apples or potatoes, as the case may be, and he would have to be stamping every one of those barrels differently, and the merchant who received them would have to be going over them and adding up all these various weights. So there is a need for a container of that size, and I do not believe that if we did not provide for that we would really be doing our duty. That is a container that is in common use, and there is a need for it.

Mr. GOODWIN. I would like to ask Mr. Fischer if this would conflict in any way with the standard apple barrel which is now provided for by law.

The SECRETARY. It is exactly the standard apple barrel.

Mr. GOODWIN. To be adopted for all other purposes?

The SECRETARY. Yes; there is some slight difference in the definition, but it is intended to be exactly the same barrel, and will not in any way alter the present law in regard to the apple barrel. But I want to say that that apple barrel is entirely permissive. Of course there is nothing in the act requiring it to be used. It simply states that if you do sell apples under that law and mark them in such a way as to get the protection of that law they must be packed in a certain way and in a barrel of a definite size. This supplements the Sulzer Act and simply brings in not only apples but potatoes and pears and everything else that is packed in a barrel and sold by the barrel.

Mr. CLARK. Would that do away with our present cranberry barrel?

The SECRETARY. Well, the Tuttle bill exempts cranberries. Now, the cranberry people are very well organized. They came over there to Congress and told them about the peculiarities of the cranberry. Apparently it is a very delicate fruit, that has to be packed in a barrel of a very definite size. I do not know how they came to select the barrel that they use at the present time, and get it just to

suit them, but apparently it just suits them; and if we were to pack this delicate fruit in barrels of the standard size I think the world would come to an end. This barrel is only an inch higher than their barrel. In the barrel that they use, the distance between the heads is 25 inches, whereas the standard barrel is 26; and my recollection of the matter is that in most cases (where they are sold at retail, at any rate) the barrel stands on end, and the maximum pressure that you get is that due to the height of the barrel. It is the difference between having 26 inches and 25 inches pressure.

Mr. CLUETT. Is it possible that the cranberry growers have got a 25-years' supply of barrels made up that they want to get rid of?

The SECRETARY. I do not think that is it. They claim that it contains a hundred quarts. I expressed myself up there one day very much as I did here, and they got the impression that I was opposed to this exemption, and in about four days I got letters from all over the country arguing for this barrel and saying that it contained exactly a hundred pounds—well, I think about half of them said a hundred pounds and half of them said a hundred quarts. Well, it does contain about a hundred pounds and a hundred quarts, but they are liquid quarts. I do not think there is any real argument in favor of it, except that they are, of course, very well organized and they would defeat, no doubt, the passage of this bill unless they are exempted. The three States of New Jersey, Wisconsin, and, I believe, Massachusetts have already specified in their laws the barrel that they want, and it was a case of either exempting that cranberry barrel from the operation of the law or else having the bill defeated.

Mr. CLUETT. I would like to state that the grocers in Chicago made a complaint at one time that the cranberry barrel was supposed to contain 100 pounds, and they all thought it was a hundred pounds, but when the price of cranberries went up the barrel shrunk to 87, without any notice being given them whatever. That does not look as though they want the same size barrel all the time.

The SECRETARY. Well, I would not like to guarantee that they did. They are willing, however, to have their barrel standardized. They do want that. They wanted a provision put in this act standardizing their barrel, but that has not been done. Mr. Tuttle himself comes from a State that has a very big cranberry industry, and, of course, he does not feel, I suppose, like antagonizing these people too much. I know that personally he is not convinced that there is any necessity for exempting it, but he is merely doing it because he thinks he has got to do it to get the bill through, and perhaps also because of the fact that there is great opposition in his own State. I understand also that some of the prominent gentlemen at the Capitol are also opposed to it—that is, they are in favor of the exemption of cranberries from the operation of this law—and altogether it looks as though we had either to exempt them or get no barrel.

Mr. GOODWIN. Mr. Chairman, as the size of the standard barrel that we are talking about here is slightly larger than the cranberry barrel now in use, I can not see where it would be any hardship for the cranberry shipper to use the standard barrel. If it was some-

thing that was going to cut off a certain amount of the commodity that they are now selling in barrels, then I can see where there would be an objection; but as long as it will contain the contents of the barrel they are now using, I think that would be all that is necessary, and I think they could adapt themselves to the standard barrel.

Mr. NEALE. Mr. Chairman, I agree with Mr. Fischer. I believe those people are right in their contention, Mr. Goodwin. We heard them argue for several hours, and with all sincerity, that that kind of fruit would not stand a larger container than the barrel they were using, and I do not believe we would gain anything by going against the proposition now, when they had practically convinced the Committee on Coinage, Weights, and Measures that they were right. Is not that your opinion, Mr. Fischer?

The SECRETARY. Why, inasmuch as we have indorsed the Tuttle bill, I do not think we ought to take any action going back on that at the present time. Inasmuch as I feel that that was somewhat taken on faith, I would like to explain to the gentleman that when I asked that that bill be indorsed, it was with the understanding that we could not get anything better than that, and I do not believe we can; and I would not like to see anything done at this time that would in any way interfere with our indorsement of that bill. But this proposition here is an entirely new one. If the States in which the cranberry barrel has been standardized would repeal that law, and all the States adopt this law, there would be no further argument for the cranberry barrel, because under the State laws they would be compelled to sell in the regular barrel, and, of course, in that case they would withdraw their opposition just exactly as the people who were opposed to the net weight container bill withdrew their opposition when they found that the States had begun to enact these laws. As I understand it, Mr. Holbrook, you are not proposing that the cranberry barrel be exempted, are you?

Mr. HOLBROOK. No.

Mr. RICHARDSON. I would like to ask a question before you put that motion. Did not that resolution that we passed yesterday about selling by weight include apples in barrels?

The ACTING CHAIRMAN. I do not think it did.

Mr. RICHARDSON. I think it does. Why is this argument about the size of the barrel? Will not that eliminate all measures?

The SECRETARY. Mr. Chairman, I thought I explained that a little while ago. There is a good deal of need—in fact, there is a necessity—for excluding that. You can not do away with the barrel. Barrels of apples are going to be shipped from one end of this country to another, no matter what you do.

Mr. RICHARDSON. Sell them by weight.

The SECRETARY. It is impossible to determine that. I am simply saying that this is an exception the same as berries are an exception. The general rule, as I understand the sense of the conference, is that in all retail trade, at any rate, things will be sold by weight that can be sold by weight, and all dry commodities can be sold by weight except a few things like berries; and in regard to the apples

and other commodities sold in these barrels, when the barrel is broken they can be sold by weight.

Mr. RICHARDSON. I understand.

Mr. HOLBROOK. Now, you have heard all that I have written out here, and so far as the barrel is concerned I think it is all right. It closely follows the Tuttle bill. I think we should change the last line of this section, relating to the half barrel, and establish something more definite; or, if you simply desire to standardize the barrel, the section will stand as read, except that the reference to the half barrel will be omitted.

The SECRETARY. I would suggest that that be done—simply standardize the barrel and leave off all reference to half barrels

Mr. GOODWIN. I think so. I second the motion.

Mr. HOLBROOK. In discussing the motion, I think one thing ought to be pointed out. I think the Tuttle bill does not carry any penalty for selling barrels that are not filled, which are not of the proper size. This section is worded, "It shall be unlawful for any person to offer or expose for sale or sell any other barrels for fruits, vegetables, or produce," etc. That will allow any size barrel to be sold except a barrel for fruits, vegetables, or produce. Now, the argument has been advanced that the manufacturer of barrels never knows, or in many cases does not know, what his barrel is going to be used for, and I admit that. But the necessity of proving the entire clause as it stands here would be upon the prosecutor, and he would be obliged to prove not only that this man had sold a barrel which was not of the proper size but also that this man had sold a barrel for fruits, vegetables, and produce that was not of the proper size. Now, if that man sold the barrels without knowing what they were to be used for, that proof would be impossible. I make it unlawful to sell barrels not of standard size for fruits, vegetables, and produce not yet filled, in order to protect an innocent shipper who might order, specifically, "produce barrels." He might order, say, a thousand produce barrels, so specified, and the manufacturer of barrels, having an illegal size on hand, might simply sell them to him with the understanding that those were to be used for produce. Now, if we did not put in this section a penalty for selling barrels for those purposes which were not of the proper size, the entire brunt of the enforcement of the law would fall upon an entirely innocent party, the man who had ordered the produce barrels, not upon the manufacturer who made and sold the barrels.

I think I have explained that possibly at sufficient length. It would be necessary to prove under this law that a man sold a barrel which was not standard, and sold it for the use of produce, etc., and if all those elements were not proved it would be impossible to convict the manufacturer.

Mr. Fischer and I have discussed this matter. You agree with that, Mr. Fischer?

The SECRETARY. Yes, I agree with that thoroughly. I think that is very important.

Mr. WOOLLEY. I move that the section be adopted, Mr. Chairman.

The motion was seconded, and the section was adopted.

Mr. HOLBROOK. That simply standardizes the barrel without mentioning other sizes of containers at all.

The final section which I desire to present comprises definitions.

The word "person" as used in this act shall be construed to import both the singular and plural, as the case demands, and shall include corporations, companies, societies, and associations.

The words "weights, measures, or weighing or measuring devices" as used in this act shall be construed to include all weights, scales, beams, measures of every kind, instruments and mechanical devices for weighing or measuring, and any appliances and accessories connected with any or all such instruments.

The words "sell" or "sale" as used in this act shall be construed to include barter and exchange.

Now, that is not at all radical. We have used that long phraseology in several places in the former bill, and my amendment includes cutting that down to the shorter phraseology and then defining it, in order to save space, time, and difficulty.

Mr. METCALF. I move the adoption of the section as read, Mr. Chairman.

The motion was seconded, and the section was adopted.

Mr. HOLBROOK. That is the extent of the new sections, which I have framed for the law.

Now, I think that it is going to waste a lot of time to read each section which I desire to amend here, but it rests entirely with the convention as to how we will consider the matter.

The SECRETARY. Mr. Chairman, I would suggest that Mr. Holbrook give two or three typical cases, perhaps pick out the most important ones, and indicate just about what their nature is; because it is going to be an impossibility for him to explain all these changes. He is not changing, as I understand, the sense of any of them, but is merely trying to put them in a little better form to assist in their enforcement—grouping certain ideas under definite headings, etc.

Mr. WOOLLEY. Mr. Chairman, I would like to ask, for information, if we have not done already, in adopting these amendments, practically sufficient to get the law into proper form.

Mr. HOLBROOK. No; I think not. For this is a slightly different proposition, of course, from what we have been going over. Those were entirely new sections; these are slight changes in the sections as they now stand in the report. For instance, we split up a section into several sections, and it is then necessary to change the phraseology; the word "he" in some cases must be made to read "the State superintendent of weights and measures," for instance, in order to indicate whom we are talking about. That indicates the nature of some of these changes.

Mr. CLUETT. How soon could we get a copy of these amendments, etc.?

The SECRETARY. I doubt very much whether it would be possible for us to get copies of these to you inside of two weeks. Then you would have to compare them, of course, with the original, as I understand it, in order to find out what the changes are.

Mr. HOLBROOK. I can mention the important changes in five minutes.

Mr. CLARK. Mr. President, I notice in the reading of those specifications for the model law that the head of the State office is referred to as the "superintendent of weights and measures." We are a little bit jealous of our standing in Massachusetts, and I would suggest that instead of the word "superintendent" the word "commissioner" be used.

Mr. RICHARDSON. Mr. Holbrook, I would ask if that law appears in the report for 1911, page 95——

Mr. HOLBROOK. No; the model law which we are talking about appears in that same volume—the Sixth Annual Conference, 1911, on page 151 et seq., entitled "Appendix."

Mr. RICHARDSON. Oh, yes. Well, is there any change to be made in the first section?

Mr. HOLBROOK. I strike out the words "by which all county and municipal standards of weights and measures shall be tried, proved, and sealed," and substitute therefor the words "of weights and measures." That is rendered necessary by the fact that we have adopted a section which provides that county and municipal standards of weights and measures shall be sealed by office standards. not by the State standards themselves.

Mr. CLUETT. Was anything decided in regard to Mr. Clark's remark?

Mr. CLARK. Mr. Chairman, in order to bring that before the meeting, I will make a motion that where the words "superintendent of weights and measures" are used the words "commissioner of weights and measures" be substituted. It seems to me it would give better standing among the people than "superintendent."

Mr. CLUETT. Might it not be well to leave that part open and leave the title optional with the State? "A rose by any other name would smell as sweet," you know. What is the difference in the name? Leave that to the State itself.

Mr. HOLBROOK. We already have a note to that effect on page 151 of the report for 1911. [Reading:]

"The aim of the conference is to have efficient laws governing weights and measures in every State and Territory, and, so far as is practicable, to have these laws uniform. It is not expected, however, that the laws shall be uniform in all minor details; the titles used, terms of office specified, bonds required, etc., in the model regulations are only suggestive, and where not in conformity with the general practices of a particular State or Territory should be changed."

The SECRETARY. Mr. Chairman, if Mr. Clark will make his motion a little differently I think that might be included. You might say that the name "commissioner" shall also be inserted—that is, "superintendent (commissioner)." I see no objection to that.

Mr. CLUETT. No.

Mr. CLARK. I will amend my motion in that way, in order that the office as it exists in some States may be included in the wording of this model regulation.

Mr. GOODWIN. I second the motion.

The ACTING CHAIRMAN. Are there any remarks?

The question was taken and the amendment was agreed to.

Mr. HOLBROOK. There is one change here that I think there might be some question about. That is in the coal section. It is not numbered here. It follows directly after section 10, on page 156 of the Sixth Annual Conference Report. The section now reads: "It shall be unlawful to sell or offer to sell in the State any coal or charcoal in any other manner than by weight, except by written agreement to the contrary." I believe that the words "except by written agreement to the contrary" should be stricken out.

Mr. CLUETT. Does that include coke?

Mr. HOLBROOK. No; that does not include coke. At the time this model law was adopted coke was included in the original section, but was stricken out on the ground that coke would take up such a large amount of water that selling it by weight would often lead to greater frauds than selling it by measure. I believe there was some discussion of that matter.

Mr. FERNER. I recently had occasion to look up the question of how much moisture would be taken up by coke and found that the amount was not as great as had been supposed; that the coke when it is made is first drenched with water anyway, and it is a question more of the degree of evaporation that has taken place, and not such a very large amount may be put in. It seemed to me very feasible, from my investigation, that coke should be sold by weight.

Mr. HOLBROOK. As a matter of record I might state that at the time this section was adopted Mr. Connors moved that the word "coke" be stricken out. Mr. Haskell believed that it should not be included. The secretary of the conference seconded Mr. Connors's motion to strike out the word "coke," and the amendment was adopted. That will be found on pages 131–132 of the book that is in your hands.

The SECRETARY. Mr. Chairman, in view of the uncertainty in regard to that, I think we had better not include it at this time, at any rate. I, myself, am doubtful as to whether coke ought to be sold by measure or whether it would be more just to sell it by weight. It is almost a toss-up.

Mr. CLUETT. Don't you think, then, that the previous action of the conference ought to settle it? They are opposed to the sale of large and bulky fruits and vegetables except by weight, and it seems to me that in order to be consistent coke should be included. It is large and bulky and of an odd shape.

The SECRETARY. In view of that I will withdraw my objections. I want to be consistent.

The ACTING CHAIRMAN. Is that your motion, Mr. Cluett—to include coke?

Mr. CLUETT. To include coke, yes.

Mr. METCALF. I second the motion.

Mr. NEALE. In writing our new law about two months ago we left coke out, feeling that it was a coal product and would be considered as coal. That is, our law was specifically like this—followed this, in fact. We provided that coal and charcoal should be sold by weight only, and when the question of coke came up we left that out purposely, assuming that it was of the coal family and would be so considered.

The SECRETARY. And that it would be unnecessary to mention it?

Mr. NEALE. That is what we felt. We figured out that coke is coal.

Mr. CONNORS. It does not seem to me that the question whether coke is large and bulky enters into this thing at all. It is a question of the manufacture of the coke. When coke is made it is wet down. Now, if they sell that coke by weight, everybody will sell it when it is fresh; but if they sell it by measure you can get a fair quantity. The moisture content is the whole thing in coke.

Mr. NEALE. I do not think moisture in that case would lend to the heating quality of the coke.

Mr. CONNORS. I think the average consumer would object to paying for water when he is buying something else.

Mr. NEALE. I think that is right.

The ACTING CHAIRMAN. Are there any other remarks on the motion. The question is on the motion of Mr. Cluett that coke be included in the section.

(The question was taken and the amendment was adopted.)

Mr. HOLBROOK. Now, to go back to the amendment which I proposed. I desire to strike out the words "except by written agreement to the contrary," and I would ask Mr. Henry specifically if he agrees to that, because it was put into the original section at his suggestion.

Mr. HENRY. I am entirely agreeable to it; in fact, I advocate it; because at the time we put it in there was a big confusion in my mind between the right of contract and the obligation of contract, and I beg to apologize for putting it in.

Mr. HOLBROOK. Here is an amendment which I desire to make in the penalty section (sec. 7), inasmuch as a question has arisen in regard to the present section. This now reads: "Any person * * * who shall sell or offer or expose for sale less than the quantity he represents, or sell or offer or expose for sale any such commodity in a manner contrary to law," etc. Now, it is contended that if the buyer provides the scales by which the weight is determined, this penalty section does not cover the matter. So I add after the words "less than the quantity he represents" the words "or shall take or attempt to take more than the quantity he represents when, as the buyer, he furnishes the weight, measure, or weighing or measuring device by means of which the amount of commodity is determined." That covers a case where the buyer weighs the commodity on his own scales. Is the amendment understood?

Mr. NEALE. Mr. Chairman, I do not quite understand that language "who shall take more than he represents." Is that just the right way to word it?

Mr. HOLBROOK. I think you will find a distinction between the word "take" and the word "receive." A man may receive more than he desires to buy; he does not very often do it, but he may. But the idea of the word "take" is more "to demand and receive." In other words, it would not be simply accepting it if he were given more, but it would be demanding and receiving more. For instance,

in the case of a legal weight of 60 pounds per bushel of potatoes, I might receive 65 pounds and I would not be liable under this section, but if I took 65 pounds I would "demand and receive" that amount of commodity; I would force the man to give me 65 pounds instead of 60 pounds.

Mr. NEALE. "Represents" is what really struck me. I represent to you that I sell you so much. Now, do you represent to me that you are only taking so much?

Mr. HOLBROOK. In some cases, yes. For instance, a junk dealer might take or attempt to take more than the quantity he represents that he is taking. Now, the way I understand the wording is, that the junk dealer using his own scale would weigh a certain quantity of rags, or whatever it was, and he would perhaps represent that the weight was 10 pounds, when in fact he might be taking 14 pounds. That would be taking more than he represented to the seller.

Mr. NEALE. He is doing the weighing?

Mr. HOLBROOK. Yes. "When, as the buyer, he furnishes the weight, measure, or weighing or measuring device by means of which the amount of commodity is determined."

Mr. HENRY. Mr. Chairman, in case there is still an ambiguity in regard to that, let me suggest that in Vermont at the last session we made an amendment with the intention of covering that particular matter, and the way it is worded there—and I feel pretty sure that the attorney general gave his approval to the wording—was "whoever in purchasing misrepresents the amount purchased." That is the same idea, is it not?

Mr. HOLBROOK. Yes; but I do not like the wording on the ground that it is going to change this whole section, because we have not used the word "misrepresents." You see, the wording we suggest is necessary in order to be coherent, since the section now reads "who shall sell or offer or expose for sale less than the quantity he represents." That section has been adopted by a great many States, and I dislike to change it any more than necessary. I think it is perfectly clear when we say that he "shall sell or offer or expose for sale less than the quantity he represents," or when as a buyer he furnishes the scales, weights, or measures, "shall take more than the quantity he represents." You see it is similar in phraseology to the section as already adopted.

Mr. CLUETT. We have an ordinance in Chicago that covers a similar thing. It is worded in this way:

> Any person, firm, or corporation measuring or weighing any article of merchandise or commodity by dry, liquid, lineal, or superficial measurement, or by any unit of enumeration used in determining or measuring quantity, or by weight, for the purpose of purchasing such article or commodity, who shall falsify the measure or weight of such article or commodity by representing the measure or weight of the same to be either more or less than the true measure or weight thereof, shall be fined not less than $25 nor more than $100 for each offense.

Mr. HOLBROOK. Does Mr. Henry object to the phraseology that we suggest?

Mr. HENRY. No; I simply wanted to avoid an ambiguity.

Mr. HOLBROOK. Mr. Neale, do you think the wording is all right, now that it has been explained?

Mr. NEALE. Yes; it is clear enough for me.

Mr. GOODWIN. I would like to suggest that we have a section in our law which covers that subject, which says that whoever sells any commodity by weight or measure for a greater quantity than is actually delivered to the purchaser shall be fined. I think that is covered in our State already.

The ACTING CHAIRMAN. Now, gentlemen, motions are in order.

Mr. CLUETT. I move that the amendment be accepted.

(The motion was seconded and the amendment was adopted.)

Mr. HOLBROOK. Now consider, if you will, a portion of section 5, where we say:

He shall be paid a salary determined by such board, said salary not to be less than $1,000 a year, and no fee shall be charged by him or by the county for the inspecting, testing, or sealing of weights, measures, or weighing and measuring devices.

Here we provided for a county sealer of weights and measures, but by an oversight no deputies were provided for. We desire to amend the section to read as follows:

Whenever the board of county commissioners shall deem it necessary, they may appoint and fix the salary of one or more deputy sealers of weights and measures. Such deputy or deputies, when not appointed merely for some temporary purpose, shall hold office for a term of five years from the date of their appointment, and all deputies appointed shall have the same powers and may perform the same duties as the county sealer when acting under his instructions and at his direction.

Mr. RICHARDSON. I move the adoption of that amendment.

(The motion was seconded and the amendment was agreed to.)

Mr. RICHARDSON. Before we leave section 5, I see it makes it mandatory on the county commissioners to pay the county sealer a salary of $1,000. Now, I understand that this law is simply suggestive in that respect. Am I right?

The SECRETARY. That is all that it is intended to be.

Mr. RICHARDSON. Because in my State we have a great number of small counties, where the supervisors would not think of paying a sealer $1,000 a year.

Mr. HOLBROOK. Consider section 6, if you will. In section 6, as adopted here, we left out the term of office of the city sealer. The term of office should be the same, I think, as that of the county sealer. Therefore, we desire to amend the section in line 7 by adding after the words "by and with the advice and consent of the common council" the words "for a term of five years." You have already adopted this term of office for the county sealer. I will read the rest of the amendment:

He shall be paid a salary to be determined by the common council, such salary not to be less than $1,000 a year, and no fee shall be charged by him or by the city for the inspecting, testing, or sealing, or the repairing or adjusting of weights, measures, or weighing or measuring devices. Whenever the mayor and common council shall deem it necessary, one or more deputy sealers of weights and measures may be appointed and their salary fixed as above, who, when not appointed merely for some temporary purpose, shall hold office for a term of five years from the date of their appointment. All deputies appointed shall have the same powers and may perform the same duties as the city sealer, when acting under his instructions and at his direction.

These provisions already apply to county sealers. There is no new matter here except the applying of it also to city sealers.

Mr. RICHARDSON. In my State the tenure of office of State officials is four years. Would it not be well to make the tenure of office of the city sealer four years to correspond with that?

Mr. HOLBROOK. Personally I think that the more difference there is in the tenure of office of the sealer and the other officials the better off the sealer is going to be. If their terms of office run out all at once, it encourages the removal of the sealer with every change of politics. For instance, if the sealer's term expires at the same time as the terms of the political officers of the county—I make this distinction since I contend that the sealer is not a political officer—then it is natural that the incoming officers should at once make a clean sweep of all the officials whose terms are expiring and appoint new men in their places; whereas if at the end of four years the political complexion of the jurisdiction changes and the sealer still holds office for another year or more, at the end of that additional time there will not be half as many hungry office seekers looking for the job, because they will have quieted down somewhat; also the officials will have had an opportunity of ascertaining whether or not the sealer is a competent man. If he has been performing his duties in a satisfactory manner, he may be continued in the office. I believe this provision will assist in the taking of the office of sealer of weights and measures out of politics.

Mr. CLUETT. I move the adoption of the amendment.

Mr. GOODWIN. I second the motion.

(The question was taken, and the amendment was adopted.)

Mr. HOLBROOK. In the last paragraph of the law we have: "All bread baked and kept for the purpose of sale, offered, or exposed for sale, or sold in the State shall be sold by weight." I desire to strike out the words "baked and."

The section as it now stands is rather indefinite, because it says "baked and kept in the State." We do not care whether bread is baked in the State or not, provided it is sold in the State. The words "baked and" I think are unnecessary there.

Mr. CLUETT. I move the adoption of the amendment.

(The motion was seconded and the amendment was adopted.)

Mr. HOLBROOK. I can assure the delegates that those are all the changes of any importance that are made in the law. The other changes are entirely changes of phraseology, etc., and do not change the idea of the sections at all.

Finally, I have here, as I stated at first, two other forms of this proposed law: One gives the State government exclusive control over the weights and measures in use in the State, without any local sealers, the powers of the county and city sealers being assigned to a State department of weights and measures. No other changes are made except those absolutely necessitated by that change in the form of the law. The other form assigns the powers of the county and city sealers to State inspectors in those districts in which no local sealer is required to be appointed and specifies that there shall be a local sealer in cities of over 25,000 and counties of over 20,000 popu-

lation; that is, it allows the State deputies to have exclusive jurisdiction except in those counties or cities. No other changes are made in this bill except those changes in phraseology absolutely necessitated by this change in the form of the law. Now, I would suggest with that explanation that the conference adopt three model bills which may be suggested to various States as local conditions require, framed along the lines which I have indicated.

Mr. WOOLLEY. Mr. Chairman, I move you that the suggestion of Mr. Holbrook be adopted.

Mr. GOODWIN. I second the motion.

(The question was taken, and the amendment was adopted.)

Mr. HOLBROOK. I thank you.

Mr. RICHARDSON. Mr. Chairman, the object of the passage of this law is simply suggestive to the States, and as I understand it the main object of this conference is to bring about a uniformity of weights and measures all over the country. This being suggestive, it is immaterial to this conference what kind of a law a State passes in order to bring about uniformity. They can fix it to suit themselves. This suggestion, of course, will be a good thing for them to go by.

The ACTING CHAIRMAN. Yes.

Mr. RICHARDSON. For instance, I know my legislature will make a good many changes in this, but it will not materially affect the operation of the law.

The SECRETARY. Mr. Chairman, we have only a very few minutes left between now and luncheon. Of course, we can meet after luncheon and continue just as long as you see fit; but before we adjourn I want to present a matter that occurs to me which ought to be cleared up. The committee on nominations yesterday did not bring in any candidate for sergeant at arms, and they did not say anything about abolishing the office, so just what the status of that particular office is at the present time is something that I do not understand. We elected one last year, and that office still exists. Now, a motion would be in order either to abolish the office, perhaps, or to elect some such officer.

Mr. RICHARDSON. Mr. Chairman, I believe I left the conference last year before it adjourned. I learned from reports made afterwards that the office of sergeant at arms was created. It seems to me that in a body of this kind we do not need a sergeant at arms.

Mr. NEALE. Mr. President, as long as that office exists, and as long as you have created the office of treasurer, I think it is useless to eliminate that particular office, because possibly next year you would have trouble enough so that you would have to create it again. So I would be in favor of continuing that particular office as long as it is on the list. I suppose the method of procedure would be to place somebody in nomination.

The ACTING CHAIRMAN. A motion to nominate somebody for that office would be in order.

Mr. NEALE. I would like to nominate the gentleman from Chicago, who has been with us constantly for the last several years—Mr. Cluett.

Mr. CLUETT. Mr. Chairman and gentlemen, I wish to say that I decline the nomination of sergeant at arms.

Mr. METCALF. Mr. Chairman, it seems to me that a sergeant at arms over a body of intelligent men of this kind is absolutely unnecessary, and I believe the office ought to be abolished in deference to the respect we have for the intelligence of the gentlemen who come to this conference. If it is in order, sir, I move you that this office be abolished.

(The motion was seconded.)

Mr. RICHARDSON. Mr. Chairman, the brother from Illinois in his tribute to the intelligence and good behavior of these fellows, has voiced my reason for not wanting a sergeant at arms.

(The question was taken and the motion was agreed to.)

Mr. HOWE. I would like to ask the Secretary if anything has been done by this conference on the subject of testing United States scales?

The SECRETARY. No.

Mr. HOWE. Now, that is a very serious question with every gentleman present. The United States Government has recently put out thousands of scales for the postal service. The Bureau of Standards, as you know, has cooperated in inspecting those scales. Now, those scales, as well as all other United States scales, should be inspected regularly. The District of Columbia has spent a great deal of time in testing United States scales, as an act of courtesy. Our law exempts the testing of United States scales. We all know, after the remarks of Mr. Briggs, and every practical sealer knows, that a scale will always be against the buyer. The United States Government is nearly always the buyer. Now, take these thousands of postal scales that have been put out. A lot of them bear the initials of the inspectors of this bureau. That is not any warrant that those scales are going to stay correct. It is not fair to this bureau or to any seller of a scale to permit a scale to be continually used without a regular inspection; and I feel that it is a matter of vital importance. I think the conference should go on record suggesting the regular inspection of all United States scales, especially now that the United States Government has virtually gone into the express business. I know of an instance in town here, and I will give it to you just as it was told to me. A candy man fixed up a box of candy weighing 15 ounces gross weight to send by parcel post to his cousin, I think, somewhere in New Jersey. He sent it down to the post office and they collected the next rate over a pound, namely, 2 pounds. He asked me if his scale was correct. I said, "Yes." "Well," he said, "I made it 15 ounces so I would not have to pay the next rate, and the postal authorities demanded the 2-pound rate." So that is what you gentlemen are going to encounter. It is going to come right down to the point where the United States Government must have some sort of force and equipment to test their postal scales. The city sealers have got a pretty big job to test these scales, particularly when they have no authority from the United States Government; so I think that is a matter which ought to be specially arranged for.

Mr. GOODWIN. That is a question that came up in my State, and as my State and every other State is supposed to have United States standards in its possession, don't you think it would be a good idea for this conference to go on record as requesting authority from the United States for the State sealer each and every year to test and correct, if necessary, the scales used in the postal service? As this gentleman says, they are virtually going into the express business, and their scales are just as liable to get out of order as any other scales and, I believe, ought to be tested annually. I think it would be the proper thing for the Government authorities to have the right to deputize the State sealers, and through them the local sealers, to test the scales of the postal authorities in each and every State.

Mr. HOWE. And with authority to condemn if not correct?

Mr. GOODWIN. Oh! Certainly.

The SECRETARY. Mr. Chairman, if this association will go on record as recommending to the Government that some inspection of its apparatus is necessary and should be made, I think we will be going just about as far as we ought to. Now, I do not think the Government is ever going to give you gentlemen authority to come in there and condemn their apparatus; they are certainly not going to do it in the post offices. If you make that recommendation, I think that the time is just about ripe for them to take some action; but I think if you go beyond that point, you will be very apt to raise opposition.

Mr. GOODWIN. Answering Mr. Fischer, I would state that the Government officials in the city of Providence have asked the city sealer to examine their apparatus.

The SECRETARY. That has been done in a number of cases, and that is the reason I think it is unnecessary for you to put in the other thing, because that is exactly what they will do of their own accord, and they may not do it if you word it the other way.

The ACTING CHAIRMAN. In New Jersey we have no trouble whatever. We went to the postmaster and explained the reason why, and there was no objection whatever.

Mr. HENRY. I move that a resolution be drawn up by three members appointed by the chair, incorporating the suggestion which Mr. Fischer has made, and that this resolution be sent to the proper department.

Mr. CLUETT. I second the motion.

(The question was taken, and the motion was agreed to.)

The ACTING CHAIRMAN. I will announce the committee, gentlemen. The committee will be Mr. Henry, Mr. Woolley, and Mr. Cluett.

QUESTIONS AND ANSWERS.

The SECRETARY. We have one other matter on the program, and I think it could be disposed of very quickly if you will take that up at this time—the matter of questions. I have a few questions here, one of which I propose to answer myself. That is:

Has the city sealer the authority to test postal scales in post offices? If found incorrect, what action, if any, is advisable?

I think that question has been answered before. You have no authority whatever, unless the post office sees fit to give it to you. But I think that there will not be any doubt about that being done in the future. It has been refused in the past, but these disclosures that have been recently made, I think, have made the department realize that they can not afford to have weights and measures in use throughout the country that are not correct. Not that they ever intended or ever supposed that they were incorrect; it was merely a matter of oversight. If you find them incorrect, of course the thing to do is to call the attention of the department to it at once.

I think that answers the question.

There was another question asked, as to the weight of a gallon of milk, I believe. Mr. Bearce will answer that question.

Mr. BEARCE. The bureau has been requested several times to answer that question, and the best authority I know of is that of Dr. Van Slyke, of the New York Experiment Station. According to his measurement, the specific gravity of milk varies from 1.029 to 1.035 at 60° F. referred to water at 60° F. as unity. That gives a weight per gallon varying from 8.57 to 8.62 pounds at 60° F. It is stated by Dr. Van Slyke that that covers the range of all ordinary herd milk, but does not cover variations of individual animals. For ordinary purposes, however, the value 8.60 is sufficiently close as the weight per gallon of milk.

The SECRETARY. The next question is:

The mining of coal is the chief industry in West Virginia. Many of the large mines have never installed scales, and the coal mined is not weighed. Do any of our weights and measures laws provide for the weighing of the coal dug by the miners? If not, why not?

Mr. Holbrook, can you answer that question? I know in a general way that some of the States have laws on the subject.

Mr. HOLBROOK. Yes. West Virginia has a law which requires that the coal mined by miners in the State shall be weighed over scales to be provided by the corporations or companies engaged in the business of mining or selling coal by weight or measure. The reference is to the Code of 1906, pages 176–178, sections 430 to 436, inclusive. If the gentleman who asked that question is here, I can let him have a copy of the law of his State upon that subject. I have a copy here.

Mr. MONTGOMERY. Mr. Chairman, I am familiar with that law, and I know that that law is on the statute books of West Virginia; but in the great coal fields up there the operators have not installed scales at all. They pay the miners by the car.

Mr. HOLBROOK. I will say regarding the enforcement of this law that there is a paragraph in the report of the inspector of this bureau on the weights and measures conditions in the city of Charleston, made in 1909, in which it is stated that many of the corporations are not maintaining scales and that coal is not being weighed at the mines as required by law; also that the governor of the State receives a number of requests each year that the law be enforced. The enforcement of weights and measures laws, however, seems to be much

neglected in the State of West Virginia, and it appears to be a fact that this law is not enforced at the present time; but there is a law on the statute books.

The SECRETARY. Mr. Chairman, I have just one more question:

Should the specifications for scales just issued or indorsed by this conference be retroactive? That is, should the specifications affect scales in use before said specifications were issued?

In reply to that I might state that these specifications have got to be adopted by the States before they will be in effect. The adoption of them by this conference does not put them into effect at all. This conference merely indorses them, and they will have to be adopted by the States. Of course it was not the intention of the committee—I do not think either Mr. Connors or myself had any idea that they were going to go into immediate effect and exclude the apparatus that did not conform to them at that time. It seems to me that the desirable way of doing that would be to say that this shall be in effect after a certain date, and perhaps give a little longer date to which apparatus might be used that is now in use and does not conform with it—make that date beyond the date at which the new apparatus shall conform with it. That would have to be a matter, I believe, for each State to decide for itself.

I think, Mr. Chairman, those are all the questions that we have at the present time, and I move that we adjourn. Mr. Henry, I believe, wants to make a motion that we adjourn to meet at 2 o'clock for some business which he is anxious to bring before us. Mr. Henry, I did not notice that you were here.

Mr. HENRY. There is that resolution, for one thing, and then there is a matter of new business which I want to bring up. I would suggest amending that to 1.45.

(The motion was agreed to. Accordingly, at 1.10 p. m., a recess was taken until 1.45 p. m.)

SEVENTH SESSION (AFTERNOON OF SATURDAY, MAY 17, 1913).

The conference reassembled at 2 p. m., Mr. Waldron presiding.

The ACTING CHAIRMAN. The first business that is in order is, I think, the report of the second special resolutions committee.

Mr. HENRY. The second special resolutions committee reports the following resolution:

Resolved, That the members of the Eighth Annual Conference on the Weights and Measures of the United States by this resolution respectfully call the attention of the United States Government to the need of a thorough and periodical inspection of the weighing and measuring apparatus used by the Government in the transaction of its business with the public.

HUGH H. HENRY.
CHARLES B. WOOLLEY.
WILLIAM F. CLUETT.

Mr. METCALF. Mr. Chairman, I move the adoption of the resolution as read.

Mr. NEALE. I second the motion, Mr. Chairman.

The question was taken, and the resolution was adopted.

Mr. HENRY. Mr. Chairman, there is a matter of new business that I wish to bring up. I will be just as brief as possible, but I think some action should be taken in regard to the matter, which is a suggestion of an amendment to one clause in the report of the committee on tolerances and specifications. Therefore I make this resolution:

Resolved, That this conference request the committee on tolerances and specifications to substitute, in the report which was yesterday accepted by this conference, for the last section on page 7, which reads as follows: "Scales equipped with a scoop counterbalanced by a removable poise or weight must not be used," another clause so worded that it will include all types of scales equipped with a scoop counterbalanced by any removable or movable device.

My purpose in offering this resolution is this: As this particular clause now reads, scales equipped with a scoop counterbalanced by a removable poise or weight must not be used. To be sure, it does not say that scales with a movable poise or other device of that sort which have a detachable scoop may be used. But we all know that if a State is to adopt the model specifications and model law which we get out, it is natural that a large part of these specifications or a large part of the law will be adopted verbatim, and it is almost a physical impossibility for the people who get out these regulations and laws to go to the bottom and ferret out the reason for each section. Therefore if there is any mistake here, I think it should be corrected; and I maintain that there is an error which should be corrected.

We have under this clause, which we have now adopted, the ruling that a scale which has the removable disk or removable poise and a detachable scoop shall not be used. Now, then, it seems to me that a

scale which has a movable poise for the same purpose of counterbalancing a detachable scoop is, if anything, more a subject of condemnation, as an opportunity for defrauding the public, or as a mechanism which is liable to error, than the type of scale which by this clause we have excluded.

The reason for that is apparent. I believe that there are very few laymen who understand the significance of moving, for instance, that little "scoop-on-and-scoop-off" weight an inch and a half or 2 inches across the back end of the beam. I do not imagine that there is one person in a thousand that understands there is any such device on a scale. On the other hand, an observant person might easily notice that in a scale of the other type where there is a scoop on the one side there is a weight to counterbalance on the other. They might easily notice that this weight was to be placed opposite the scoop, and they would naturally expect that something ought to be placed on the opposite side to counterbalance the scoop which they see on there. So that the general public have every opportunity, it seems to me—or have good opportunity—to discover any means of fraud under the condemned scales, but under the scales which we have not condemned they have the very least opportunity.

But the very worst feature of this proposition, it seems to me, is this—not just what is now in existence, but what may happen. We have here made a specific statement. We have described almost exactly the type of scale which we wish to eliminate. We have been specific where we might have been general. If we had been general, instead of being at fault on the main proposition, we would have then been under no possible criticism for any discrimination; and it seems to me undebatable that wherever it is possible, in a law or in a regulation, there should be adopted a general rather than a specific provision. For as soon as you enact a specific provision, you have immediately told the enemies of honest weights and measures just exactly what they can not do, and from that they can tell just exactly what they can do, and you have merely closed the door and left the four sides of the building through which they can cut a door at any time they wish. I believe in building a fence around the whole building; and if we make this a general clause that is necessarily the result.

Now, then, it may be argued that this proposition which I advocate will work a hardship, but I think the best proof of the value of the suggestion is that I have tried this out in the State of Vermont, and there we have had this regulation in force for a year from the first of last November, and since that time there has been no complaint on the part of the merchants, as far as I know, that this regulation has given them any hardship. It seemed to me at the time we put the regulation in force that a hardship was liable to result, and we only put it in force because of the fact that I had had so many complaints that it seemed necessary to make such a regulation; and, by the way, these complaints were against the kind of scale, which is not mentioned in this clause—not against the even balance "scoop on and scoop off" scale, not on the spring "scoop on and scoop off" scale, but on the very types which here, by failure of being mentioned, are allowed. The

merchants found if they needed a "scoop-on" scale and a "scoop-off" scale that they could provide themselves with each; and I think 90 per cent of the people using this very type of scale have told the inspectors and myself when they spoke of this regulation that they had absolutely no objection, because they practically never used the scale except as a "scoop-on" scale. If the party is so poor that it would be impossible for him to provide himself with a "scoop-on" scale and a "scoop-off" scale, and if it was necessary—or he thought it was—for him to use this particular scale as a "scoop on and scoop off" scale, still he could pin this objectionable device on the beam in a "scoop-on" position—which is a very simple matter and very inexpensive—when he needs the scoop, of course leaving it at "scoop on," and when he wants the scoop off, leaving it at "scoop on" and putting a weight on the platform of the scale, which has exactly the same result so far as the scale is concerned. So far as the merchant is concerned, however, it has an entirely different result; because if the scale is used for selling—which it will be, I think, more than three-quarters of the time—if the merchant makes a mistake under my suggested method, the mistake goes against him; whereas if he makes the mistake of not putting the poise over in the right place, the mistake goes against the customer.

Mr. BRIGGS. You are proposing, then, to substitute a weight in place of the "scoop-off" feature of the scale?

Mr. HENRY. Why, if that is necessary. That is simply a suggestion; because you can anticipate that there might be people who would look at the matter just as I did—that this would probably work a tremendous hardship on the merchant. As a matter of fact, it does not; but if it did, that would be the remedy.

Mr. BRIGGS. Suppose, for the sake of argument, that you put on a weight when the scoop was off; still, fraudulent practice would be possible in that case by putting on the weight at the same time you have the scoop on, and they would still have the same opportunities for fraud as before, and it might go unnoticed, the thing in operation being a little confusing to the customer.

Mr. HENRY. I think that any customer who had watched the merchant put a scoop on one side and the weight to counterbalance on the other would immediately see, as a pure layman, that it would not be logical to put the scoop and the counterbalancing weight on the same side or on the same platform.

Mr. BRIGGS. Stop and think about it; will the ordinary customer, in the course of his ordinary purchasing, think of such a thing, or would he be more likely to accept the thing automatically without analyzing it? That is an open question.

Mr. HENRY. Well, I can not imagine a layman who would think it would be logical to pile on more weight on the same place which he intended to counterbalance.

The SECRETARY. Mr. Chairman, I would suggest that Mr. Henry be permitted to finish his argument before any questions are taken up.

Mr. HENRY. I think that is all. I am advocating that this particular clause should be general and applied to all scales that have the same effect and the same faults.

The SECRETARY. Mr. Chairman, as I understand it, Mr. Henry is in thorough accord with what we have done, only he does not think we have gone far enough.

Mr. HENRY. That is it exactly.

The SECRETARY. Now, of course, his argument as to the relative importance of those two effects I think is debatable. I will say that we considered the other proposition. You can imagine that we would naturally have tried to exclude the use of the movable poise if we could have done so; that is, it would be our natural inclination to eliminate that; and the question as to whether that can be done is one that I would rather leave to Mr. Connors. He has more familiarity with that particular phase of the question than I have. I merely want to point out to this conference just what Mr. Henry is criticizing. He is not objecting to what we have done; he is not saying that what we have done is wrong; but his point is that we have not been stringent enough—that we have not included all the things.

Mr. CONNORS. Mr. Chairman, the scale which Mr. Henry is referring to is a platform scale which sometimes has a latch which turns toward the fulcrum and from the fulcrum when the scoop is put on or put off the platform. It also carries a poise which is moved forward or back, as the scoop is on or off the platform. Now, this scale is used mostly in hardware stores and stores where general business is done, which requires at times the use of a scoop and, at other times, the platform.

Now, if we regulate against that scale we simply destroy the availability of the scale. On the customer's side of the beam there is a device which says "scoop on" and "scoop off," indicating to the customer where the scoop should be; and it is always presumed that the customer when buying anything will use reasonable efforts to protect himself. That is, we can not make regulations which will absolutely protect the customer. The customer is supposed to do a little looking for himself when he is buying. I want to say for the information of the people here that the regulation was tried out in New York State, and after a thorough investigation of the subject by Dr. Reichmann he issued a further regulation allowing the use of this scale. Now, I want to ask Mr. Henry a question, if he will permit me. Do you allow the use of a scale in your State which when you turn a knob says "Read red figures," indicating that you are to use red figures when the knob is turned showing a red pointer?

Mr. HENRY. Yes.

Mr. BRIGGS. This is on the same principle. If you make a regulation which says this scale can not be used, you simply have got to throw out other devices, very fair devices, which have a means of indicating to the customer the general plan of the scale. Now, the scale in question is a high-class scale; there is no question about that. It is a very expensive scale, and it is only used in stores where good business is done. It is made in the best possible manner as far as scale making goes.

Mr. GOODWIN. In removing or replacing the scoop on the scale does it automatically adjust itself, or do you have to adjust it?

Mr. CONNORS. You have to adjust it.

Mr. GOODWIN. Then I think it is a bad feature. If that thing could be made automatic, so that in taking the scoop off the scale or placing it on it would adjust the scale automatically, I think it would be a good thing.

Mr. CONNORS. Mr. Chairman, you can not adopt a proposition to make scales automatic. The operator of the scale generally has to do some certain thing. Now, we are up against it on account of the limits of scale building, and we can not make regulations saying that these specific things must go out, because they will also operate to shut out other good devices. Let us be fair to everybody. If a good scale is on the market, let it remain on the market.

There is another proposition, Mr. Chairman, aside from the question of the scale itself. The convention yesterday adopted these regulations. Now, considering the small handful of men here today, it does not seem to be a fair proposition to those gentlemen who were here yesterday to change in any way the regulations which they passed yesterday without due notice to them. I want the gentlemen to consider that seriously. But I would like to hear a thorough discussion of this particular scale, because I want to hear what the sealers think of it.

I want to make it perfectly clear what this regulation excludes. It says "Scales equipped with a scoop counterbalanced by a removable poise or weight must not be used." That is, if a man has a poise on his beam that he can take off the beam and put to one side, that scale would be thrown out by these regulations. If a man had a counterpoise weight that could be taken off the counterpoise when the scoop was on or off the platform, that would be thrown out. An equal-arm scale with a removable weight on one side—a ring weight, we will say—and a scoop on the other would be thrown out. A family scale which had a removable scoop would be thrown out. We did not, however, say that a scale with this latch on the beam, or a poise that you could shift from one part of the beam to the other to counterbalance the scoop, must not be used; because, taking everything into consideration, we think that we should allow it to be used.

Mr CLARK. Mr. Chairman, I take about the same view as our friend from Vermont. We have a good deal of trouble with the scale he has in mind, inasmuch as the shift of that poise is not always thought of. The clerk himself may forget about it, and it seems that if we are going to exclude, as we have here, the removable counterpoise weight, there is no reason why we should not bar this other kind. I find in my work among the sealers, for instance, that they often forget that that scale should be adjusted first with the pan off and the counterpoise weight off. Now, if they forget it in their work, how should the customer be expected to know that that little poise on the end of the beam has anything to do with the weighing? I know my friend Mr. Connors says there is something there to tell them what it is for; but how many are going to look for it? Now, if we eliminate the use of the scale with the removable counterpoise, I see no reason why we should not eliminate the use of the other.

Our friend Connors has made the point that the action of the whole conference yesterday, in adopting these specifications, should not be overthrown by the vote of a handful. Now, if that is the case, and it is not fair to decide upon this point to-day, then we had better not discuss it at all.

Mr. CONNORS. Mr. Chairman, I would like to hear the thing discussed; I do not have any objection to that; and I think all the members here would like to hear it discussed, because we want information. As I said before, I do not think it is fair for the convention to take any action, but I would like to bring out the merits of the case.

Mr. BRIGGS. Mr. Chairman, my own idea in the matter is that there is a slight distinction between the poise that is attached to the beam and the removable weight, because if the man who is weighing forgets to operate the poise when it is attached to the beam, the chances are very much greater that he will forget to take off or put on the counterpoise weight properly when this counterpoise weight is removable. My impression is that I, as a customer, would notice the misuse of the former much quicker than the misuse of the latter. That is my own impression and opinion. Of course both are objectionable, but it seems to me the removable weight is more objectionable than the attached.

Mr. GOODWIN. I would like to ask if you do not think some automatic device could be applied so as to make a positive counterbalance.

Mr. CONNORS. Mr. Chairman, it would be a great thing if we ever got an automatic device such as Mr. Goodwin speaks of. At the present time there is nothing on the market of that kind, and you can not make regulations compelling somebody to invent something and put it on the market.

Mr. GOODWIN. By agitating this question and bringing it before the public you will create a demand, which will be supplied sooner or later. We want something that can not be made fraudulent; that is the idea—to make something that is automatic, so that no dealer can use it fraudulently.

Mr. CONNORS. Mr. Chairman, when that device comes on the market, it will be a very easy matter to make a regulation to cover it, but at the present time we can not make a regulation.

Mr. NEALE. Gentlemen, there is on the market a platform scoop scale which automatically operates and balances with the scoop or without the scoop.

Mr. CONNORS. Mr. Chairman, I would like to ask Mr. Neale, if he knows, whether that manufacturer is still continuing the manufacture of that scale?

Mr. NEALE. Yes. I was at the agricultural college about two months ago, and they had a new one for the careful packing of their seeds. Perhaps you have all seen it and forgotten it. The bottom of the scoop is cut through the platform. It pulls through the platform, and a counterbalance arrangement just balances it. Then when the load comes on the platform comes up. I do not know that it is a very desirable arrangement, but there is on the market such an automatic scoop scale.

Mr. CONNORS. I understand, Mr. Chairman, from people who ought to know, that the scale Mr. Neale speaks about is a failure, and that the manufacture of it has been discontinued or is being discontinued.

Mr. HOWE. For the information of Mr. Connors, I would say that I tested a brand new one of the type that Mr. Neale speaks of no later than Wednesday. It was just unboxed and came from the factory.

Mr. GOODWIN. What kind of test did you get?

Mr. HOWE. A correct one.

Mr. HENRY. Mr. Chairman, it seems to me that I should answer the point that Mr. Connors made. He spoke of being fair to all. That is just the proposition that I am trying to maintain. We have got to be fair to all people, all manufacturers, and all types of scales, and put them all under exactly the same tests. It does not seem to me that it should make any difference in my argument here—and I do not think it does—whether I happen to be from Florida, from California, or from Vermont; and it should not make a particle of difference whether this device happens to be on the back end of the beam or on the other end of the beam; and that seems to me to be the distinction made in this regulation.

Mr. CONNORS. I would like to have Mr. Henry explain that a little more fully. Where in the regulations is a removable weight allowed?

Mr. HENRY. It is not allowed. That is it exactly. If it is removable and on one end of the beam, then it is excluded; but if it is movable and on the other end of the beam, then the scale is allowable. It seems to me a distinction without a difference.

Mr. CONNORS. It is the opinion of the committee that a removable device should not be used on any scale, on account of the great possibility of error.

Mr. HENRY. I will answer that by saying that it seems to me the possibility of error is even greater, from any view of the case, when the device is movable, not removable. If the objection is that the weight might be taken off and removed permanently, and therefore the number of errors would be increased, it does not seem to me that that is a valid objection, because the man who throws the disk away and who gets into difficulty on account of giving false and incorrect weight would be sure to be convicted.

There is not only this particular device that they speak of which will take care of this matter, but there are other devices, as we all know. One, for instance, is the scale which has the platform and the scoop arrangement at the same time, used independently. It seems to me that the fact that this particular thing we spoke of has been patented is not an objection, and could not be used as a bar. It certainly is not to be conceded by us or by any scale manufacturer that because one concern has patented a simple device to take care of that matter, it is impossible, or even very difficult, for other manufacturers to avoid this difficulty in a similar manner.

The SECRETARY. Mr. Chairman, it seems to me that there is a great deal that might be said in favor of a movable weight that is attached to a scale, and you can not get away from it. There is a good deal more to be said in favor of it than of a weight that can be completely taken away from the scale and lost entirely, and

where there is nothing on the scale to indicate that that weight should be used at certain times and not used at other times. Now, there is nothing to prevent us, if new inventions are perfected, from coming back here next year, if you see fit, and recommending—these are not going to be laws; they are regulations—that an additional regulation be passed prohibiting all movable parts, or prescribing that if this movable weight is there it shall be clearly indicated what its purpose is, and also when it is in operation properly.

Mr. HENRY. Mr. Chairman, I would like to say a few words more in order to clear this matter up, and then we can go ahead with the discussion, or stop it, as you see fit. It seems to me, in the first place, that a rather hard inference has been brought upon me for bringing up this matter when so few were here, after the regulations had been adopted in toto yesterday by the entire body. But, as you all know, that was absolutely a result of circumstances. I was anxious yesterday afternoon to present this proposition, but it was an impossibility. I had to defer it until the proper time came, without interrupting something else.

But if there is anything unfair about that—and there is the further objection, of course, that we have not perhaps sufficient opportunity to thrash it out—why would it not be a good solution to lay this resolution on the table, to be taken up at some specific time, to be designated by the executive committee, at the next session?

Mr. CONNORS. Mr. Chairman, I do not want to criticize Mr. Henry. I know it is only because of circumstances that there was a small crowd here to-day, and I do not want Mr. Henry to think that I criticize him at all for bringing it up, because I knew it was coming, and I hoped there would be a large crowd here; but I just wanted to call the attention of the members to the fact that it would not be a fair proposition to overthrow the work of the convention yesterday.

Mr. HENRY. Do you agree with my solution—laying it on the table?

The SECRETARY. I think that is a fair proposition.

Mr. HENRY. Then I will make that motion.

The ACTING CHAIRMAN. Mr. Henry makes a motion to lay it on the table. Is there a second?

Mr. WOOLLEY. I second the motion.

(The question was taken, and the motion was agreed to.)

Mr. NEALE. Mr. Chairman, a question for information. This is not an objection, but a criticism of one part in that report. Will it be the proper time at the next meeting to take that up?

The SECRETARY. Mr. Chairman, it seems to me that this discussion here shows the impossibility of discussing those tolerances and regulations at a conference of this kind. You gentlemen have to appoint a committee, and you have either to accept or reject their report. Now, of course, we have not consulted everybody. We can not consult everybody; but I have invited everybody that I have talked with to send me any objections that they have to any of those regulations, and I am sure that Mr. Connors and I will give them every

consideration in the world, and perhaps substitute some of the changes that have been suggested.

Mr. RICHARDSON. Mr. Chairman, I want to make a motion that the thanks of this conference be extended to the officers and employees of the Bureau of Standards for the courtesies extended to this conference at this session.

The SECRETARY. I think that has already been done, Mr. Richardson.

Mr. RICHARDSON. Well, we can afford to thank you twice.

Mr. NEALE. Mr. President, it has been our custom, in rather an empty manner, to thank Mr. Caswell year after year for two days' work. Surely on this occasion he is entitled to the square of that two, or twice as much thanks. As we smoke and fight and enjoy ourselves, he is the one that does the real work, and I move that we extend the thanks of this conference to Mr. Caswell for his careful work on our behalf.

(The motion was seconded and agreed to.)

Mr. WOOLLEY. Mr. Chairman, I would like to make a suggestion—that when we meet again—which will undoubtedly be a year from now—we have one session a day, and let that session continue to such a time as the majority of the members desire, possibly 2 o'clock which will give the delegates an opportunity to employ the rest o the time in seeing the city. We have been very busy this year, and consequently we have not had an opportunity to do very much outside of our labors here. That is merely a suggestion.

The SECRETARY. Mr. Chairman, I might say that as a result of a number of suggestions that I have had—one from our president here—it is my purpose to write every member a circular letter asking for suggestions as to what we ought to do at out next conference. It is very hard indeed for us to get the point of view of all of the members, and it is very difficult for our executive committee to get together. It is going to be harder than ever this year, because we are scattered all over the United States now, and it is difficult for us to have meetings and discuss these questions. So it is left largely to me, or has been at any rate, as to the arrangement of the program, and for any defects in that I will hold myself responsible. I did not realize until the program had been made up, and a number of the gentlemen had been asked to prepare papers, that we were going to have such a full program, and I regret as much as anyone else does that so little opportunity was afforded for members to see our city.

Mr. HOWE. Mr. Chairman, as a suggestion, it seems to me that there is about two hours a day lost in these conferences in going to and from the Bureau of Standards. For your information, I would state that there is a very fine room in the District Building, and if we could meet down there it would save two hours or more a day, which could be devoted to our work. I do not doubt that the District Commissioners would be only too glad to loan that room for the use of the conference, and I would suggest very strongly that the executive committee communicate with the District Commissioners and request the use of that room.

Mr. RICHARDSON. Is it understood that the executive committee will fix the date of the next conference?

The ACTING CHAIRMAN. That is left to the committee.

The SECRETARY. If it is not, I suggest that it be left to the committee. That has been customary, but it has also been customary to discuss it.

Mr. RICHARDSON. I suggest that we meet at the same time next year as we did this and make it four days.

The ACTING CHAIRMAN. You would not leave it to the executive committee?

The SECRETARY. Mr. Richardson made that same suggestion last year, and as a result of that this particular date was set. Now, it seems to me that it would be a mistake to set that definitely at this time. You see we have not anything like a full attendance here, and I think the committee should be authorized to canvass the situation. I see no reason now why we should not hold it at this time again, but it is a long time ahead.

Mr. RICHARDSON. I think all the members have been pleased with this time.

The SECRETARY. I am glad to know that.

Mr. BYRNE. Mr. President, I will make a motion that we adjourn, and that the date of the future meeting be left in the hands of the executive committee.

(The motion was seconded and agreed to. Accordingly, at 2.55 p. m., the conference adjourned.)

APPENDIX.

MODEL STATE LAW ON THE SUBJECT OF WEIGHTS AND MEASURES, DRAFTED BY THE NATIONAL BUREAU OF STANDARDS AND INDORSED BY THE EIGHTH NATIONAL CONFERENCE ON WEIGHTS AND MEASURES.

FORM NO. 1.[1]

SECTION 1. The weights and measures received from the United States under a resolution of Congress approved June 14, 1836, and such new weights and measures as shall be received from the United States as standard weights and measures in addition thereto or in renewal thereof, and such as shall be supplied by the State in conformity therewith and certified to by the National Bureau of Standards shall be the State standards of weight and measure.

SEC. 2. In addition to the State standards of weights and measures, provided for above, there shall be supplied by the State at least one complete set of copies of these, to be kept at all times in the office of the State superintendent (commissioner) and to be known as office standards; and such other weights, measures, and apparatus as may be found necessary to carry out the provisions of this act, to be known as working standards. Such weights, measures, and apparatus shall be verified by the State superintendent (commissioner), or his deputy, or inspectors, at his direction, upon their initial receipt and at least once in each year thereafter, the office standards by direct comparison with the State standards, the working standards by comparison with the office standards. When found accurate upon these tests the office and working standards shall be sealed by stamping on them the letter "—" and the last two figures of the year with seals which the State superintendent (commissioner) shall have and keep for that purpose. The office standards shall be used in making all comparisons of weights, measures, and weighing or measuring devices submitted for test in the office of the superintendent (commissioner) and the State standards shall be used only in verifying the office standards and for scientific purposes.

SEC. 3. There shall be a State superintendent (commissioner) of weights and measures, who shall be appointed by the governor, by and with the advice and consent of the senate. Such superintendent (commissioner) shall be appointed for a term of five years, and shall receive a salary of $——— a year. There shall be a deputy superintendent (commissioner) of weights and measures and inspectors of weights and measures, the deputy to be appointed by the superintendent (commissioner) of weights and measures and to hold office during the superintendent's (commissioner's) term of office, the inspectors to be appointed from an eligible list prepared by the civil service board and under the rules of said board. The superintentent (commissioner) of weights and measures shall be allowed for salaries for the deputy superintendent (commissioner) of weights and measures, inspectors of weights and measures, clerical services, traveling and contingent expenses for himself, his deputy, and inspectors such sums as shall be appropriated by the legislature.

SEC. 4. The State superintendent (commissioner) of weights and measures shall forthwith, on his appointment, give a bond in the penal sum of $5,000, with sureties, to be approved by the secretary of state (attorney general) for the faithful performance of the duties of his office and for the safe-keeping of the standards intrusted to his care and for the surrender thereof immediately to his successor in office or to the person appointed by the governor to receive them. The deputy superintendent (commissioner) of weights and measures and each inspector of weights and measures shall forthwith upon his appointment give a bond in the penal sum of $1,000, with sureties, to be approved by the secretary of State (attorney general), for the faithful performance of the duties of his office and for the safe-keeping of any apparatus intrusted to his care.

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[1] For an explanation of the three forms of the model law given in the Appendix, see p. 227 et. seq.

SEC. 5. The superintendent (commissioner) of weights and measures shall take charge of the standards adopted by this act as the standards of the State, and cause them to be kept in a fireproof building belonging to the State (or in a safe and suitable place in the office of the superintendent), and from which they shall not be removed except for repairs or for certification, and he shall take all other necessary precautions for their safe-keeping. He shall maintain the State standards in good order and shall submit them at least once in ten years to the National Bureau of Standards for certification. He shall keep a complete record of the standards, balances, and other apparatus belonging to the State and take a receipt for same from his successor in office. He shall annually, on the first day of ———, make to the governor a report of all work done by his office.

SEC. 6. The State superintendent (commissioner) of weights and measures shall have and keep a general supervision of the weights, measures, and weighing or measuring devices, offered for sale, sold, or in use in the State. He or his deputy, or inspectors at his direction, shall, upon the written request of any citizen, firm, corporation, or educational institution in the State, test or calibrate weights, measures, and weighing or measuring devices used as standards in the State. He, or his deputy, or inspectors, at his direction, shall at least once annually test all scales, weights, and measures used in checking the receipts or disbursements of supplies in every institution for the maintenance of which moneys are appropriated by the legislature, and he shall report in writing his findings to the supervisory board and to the executive officer of the institution concerned, and, at the request of such board, or executive officer, the superintendent (commissioner) of weights and measures shall appoint in writing one or more employees then in the actual service of the institution who shall act as special deputies for the purpose of checking the receipts or disbursements of supplies.

SEC. 7. When not otherwise provided by law the State superintendent (commissioner) shall have the power, and it shall be his duty to inspect, test, try, and ascertain if they are correct, all weights, measures, and weighing or measuring devices kept, offered, or exposed for sale, sold, or used or employed by any proprietor, agent, lessee, or employee in proving the size, quantity, extent, area, or measurement of quantities, things, produce, or articles for distribution or consumption purchased or offered or submitted by such person or persons for sale, hire, or award, and he shall have the power to and shall from time to time weigh or measure and inspect packages or amounts of commodities of whatsoever kind kept for the purpose of sale, offered or exposed for sale, or sold or in the process of delivery, in order to determine whether the same contain the amounts represented, and whether they be offered for sale or sold in a manner in accordance with law. He shall at least twice each year and as much oftener as he may deem necessary see that all weights, measures, weighing or measuring devices used are correct. He may for the purpose above mentioned, and in the general performance of his official duties, enter and go into or upon, and without formal warrant, any stand, place, building, or premises, or stop any vendor, peddler, junk dealer, coal wagon, ice wagon, delivery wagon, or any dealer whatsoever, and require him, if necessary, to proceed to some place which the State superintendent (commissioner) may specify, for the purpose of making the proper tests. Whenever the State superintendent (commissioner) finds a violation of the statutes relating to weights and measures, he shall cause the violator to be prosecuted.

SEC. 8. Whenever the State superintendent (commissioner) compares weights, measures, or weighing or measuring devices and finds that they correspond or causes them to correspond with the standards in his possession, he shall seal or mark such weights, measures, or weighing or measuring devices with appropriate devices.

SEC. 9. The State superintendent (commissioner) shall condemn and seize and may destroy incorrect weights, measures, or weighing or measuring devices which, in his best judgment, are not susceptible of satisfactory repair; but such as are incorrect and yet may be repaired, he shall mark or tag as "Condemned for repairs." The owners or users of any weights, measures, or weighing or measuring devices of which such disposition is made, shall have the same repaired or corrected within ten days, and they may neither use nor dispose of the same in any way, but shall hold the same at the disposal of the superintendent (commissioner). Any weights, measures or weighing or measuring devices which have been "condemned for repairs," and have not been repaired as required above, shall be confiscated by the superintendent (commissioner).

SEC. 10. The powers and duties given to and imposed on the State superintendent (commissioner) of weights and measures by sections 7, 8, and 9 of this act are hereby given to and imposed upon his deputy and inspectors also, when acting under his instructions and at his direction.

SEC. 11. The superintendent (commissioner) of weights and measures, his deputy and inspectors, are hereby made special policemen, and are authorized and empowered to arrest, without formal warrant, any violator of the statutes in relation to weights and measures, and to seize for use as evidence, without formal warrant, any false or unsealed weight, measure, or weighing or measuring device or package or amounts of commodities found to be used, retained, or offered or exposed for sale or sold in violation of law.

SEC. 12. Any person who shall hinder or obstruct in any way the superintendent (commissioner) of weights and measures, his deputy, or inspectors, in the performance of his official duties shall be guilty of a misdemeanor, and upon conviction thereof in any court of competent jurisdiction shall be punished by a fine of not less than $20 or more than $200, or by imprisonment in the county jail for not more than three months, or by both such fine and imprisonment.

SEC. 13. Any person who shall impersonate in any way the superintendent (commissioner) of weights and measures, his deputy, or inspectors, by the use of his seal or counterfeit of his seal, or otherwise, shall be guilty of a misdemeanor, and, upon conviction thereof in any court of competent jurisdiction, shall be punished by a fine of not less than $100 nor more than $500, or by imprisonment for not more than one year, or by both such fine and imprisonment.

SEC. 14. It shall be unlawful to sell or offer to sell any coal, coke, or charcoal in any other manner than by weight. It shall be unlawful for any person to deliver any coal, coke, or charcoal without each such delivery being accompanied by a delivery ticket and a duplicate thereof, on each of which shall be in ink or other indelible substance, distinctly expressed in pounds, the gross weight of the load, the tare of the delivery vehicle, and the quantity or quantities of coal, coke, or charcoal contained in the vehicle used in such deliveries, with the name of the purchaser thereof, and the name of the dealer from whom purchased. One of these tickets shall be surrendered to the State superintendent (commissioner), his deputy, or inspectors upon his demand for his inspection, and this ticket or a weight slip issued by him when he desires to retain the original shall be delivered to the said purchaser of said coal, coke, or charcoal, or his agent or representative at the time of the delivery of the fuel; and the other ticket shall be retained by the seller of the fuel. When the buyer carries away the purchase, a delivery ticket showing the actual number of pounds delivered to him must be given to him at the time the sale is made.

SEC. 15. It shall be unlawful to keep for the purpose of sale, offer or expose for sale, or sell any commodity in package form unless the net quantity of the contents be plainly and conspicuously marked on the outside of the package, in terms of weight, measure, or numerical count: *Provided, however*, That reasonable variations or tolerances shall be permitted, and that these reasonable variations or tolerances and also exemptions as to small packages shall be established by rules and regulations made by the superintendent (commissioner) of weights and measures: *And provided, further*, That this section shall not be construed to apply to those commodities in package form the manner of sale of which is specifically regulated by the provisions of other sections of this act.

The word "package" as used in this section shall be construed to include the package carton, case, can, box, barrel, bottle, phial, or other receptacle put up by the manufacturer; or, when put up prior to the order of the commodity, by the vendor, which may be labeled, branded, or stenciled or otherwise marked, or which may be suitable for labeling, branding, or stenciling, or marking otherwise, making one complete package of the commodity. The word "package" shall be construed to include both the wholesale and retail package.

SEC. 16. It shall be unlawful to keep for the purpose of sale, offer or expose for sale, or sell any commodity composed in whole or in part of cotton, wool, linen, or silk, or any other textile material on a spool or similar holder, or in a container or band, or in a bolt or roll, or in a ball, coil, or skein, or in any similar manner, unless the net amount of the commodity in terms of weight or measure shall be definitely, plainly, and conspicuously marked on the principal label, if there be such a label; otherwise on a wrapping, band, or tag attached thereto.

The words "spool or similar holder, container or band, bolt or roll, or ball, coil, or skein" shall be construed to include the spool or similar holder, container or band, bolt or roll, or ball, coil, or skein put up by the manufacturer; or when put up prior

to the order of the commodity, by the vendor. It shall be held to include both the wholesale and the retail package.

SEC. 17. It shall be unlawful for any person to sell, or offer to sell any butter, or renovated or process butter, or oleomargarine in any other manner than by weight. It shall be unlawful for any person to put up, pack, or keep for the purpose of sale, offer or expose for sale, or sell any butter, or renovated or process butter, or oleomargarine in the form of prints, bricks, or rolls in any other than the following sizes, to wit: One-quarter pound, one-half pound, one pound, one and one-half pounds, or multiples of one pound. Each print, brick, or roll shall bear a definite, plain and conspicuous statement of its true net weight, on the principal label, where there be such a label, otherwise on the outside wrapper thereof; such statement shall be in gothic type not less than one-quarter inch square.

The prints, bricks, or rolls referred to in this section shall be construed to include those prints, bricks, or rolls put up by the manufacturer or producer; or when put up prior to the order of the commodity, by the vendor.

SEC. 18. All bread kept for the purpose of sale, offered or exposed for sale, or sold, shall be sold by weight. To each loaf of bread shall be attached a label plainly showing its correct weight and the firm name of the manufacturer thereof, the size of the label and type to be used to be specified by the State superintendent (commissioner) of weights and measures. It shall be unlawful for any person to make or keep for the purpose of sale, offer or expose for sale, or sell any bread other than such as shall be in accordance with the provisions of this section.

SEC. 19. Bottles used for the sale of milk or cream shall be of the capacity of one-half gallon, three pints, one quart, one pint, one-half pint, and one gill, filled full to the bottom of the lip. The following variations on individual bottles or jars may be allowed, but the average content of not less than twenty-five bottles selected at random from at least four times the number tested must not be in error by more than one-quarter of these tolerances: Six drams above and six drams below on the half gallon, five drams above and five drams below on the three-pint, four drams above and four drams below on the quart, three drams above and three drams below on the pint, two drams above and two drams below on the half pint, and two drams above and two drams below on the gill. Bottles or jars used for the sale of milk or cream shall have clearly blown or otherwise permanently marked in the side of the bottle, the capacity of the bottle and the word "sealed"; and in the side or bottom of the bottle the name, initials, or trade-mark of the manufacturer and a designating number, which designating number shall be different for each manufacturer and may be used in identifying the bottles. The designating number shall be furnished by the State superintendent (commissioner) of weights and measures upon application by the manufacturer. and upon the filing by the manufacturer of a bond in the sum of $1,000, with sureties, to be approved by the secretary of State (attorney general), conditioned upon his conformance with the requirements of this section. A record of the bonds furnished, and the designating numbers and to whom furnished, shall be kept in the office of the superintendent (commissioner) of weights and measures.

Any manufacturer who sells or offers to sell milk or cream bottles to be used in this State that do not comply as to size and markings with the provisions of this section shall suffer a penalty of $500, to be recovered by the attorney general in an action against the offender's bondsmen to be brought in the name of the people of the State. Any dealer who uses, for the purpose of selling milk or cream, jars or bottles purchased after this law takes effect that do not comply with the requirements of this section as to markings and capacity shall be deemed guilty of using a false or insufficient measure.

Sealers of weights and measures are not required to seal bottles or jars for milk or cream marked as in this section provided, but they shall have the power to and shall from time to time make tests on individual bottles used by the various firms in the territory over which they have jurisdiction in order to ascertain if the above provisions are being complied with, and they shall immediately report violations found to the State superintendent (commissioner) of weights and measures.

SEC. 20. The standard barrel for fruits, vegetables, and produce shall be of the following dimensions when measured without distension of its parts: Diameter of head inside of staves, seventeen and one-eighth inches; distance between heads, inside measurement, twenty-six inches; the outside bilge or circumference not less than sixty-four inches; and the thickness of staves not more than four-tenths of an inch: *Provided*, That any barrel of a different form having the same distance between heads and a capacity of seven thousand and fifty-six cubic inches shall be a standard barrel. It shall be unlawful for any person to offer or expose for sale or sell any other barrels

for fruits, vegetables, or produce, or any fruits, vegetables, or produce in other barrels than the standard barrel as defined in this section.

SEC. 21. It shall be unlawful to sell or offer to sell any berries or small fruits in any other manner than by weight, dry measure, or in the containers described in this section. It shall be unlawful to procure or keep for the purpose of sale, offer or expose for sale, sell, or give away baskets or other open containers for berries or small fruits, holding one quart or less, or to procure or keep for the purpose of sale, offer or expose for sale, or sell berries or small fruits in baskets or other open containers, holding one quart or less, of any other than the following capacities, when level full: One quart, one pint, or one-half pint, standard dry measure.

SEC. 22. Whenever any commodity is sold on a basis of weight, it shall be unlawful to employ any other weight in such sale than the net weight of the commodity; and all contracts concerning goods sold on a basis of weight shall be understood and construed accordingly. Whenever the weight of a commodity is mentioned in this act, it shall be understood and construed to mean the net weight of the commodity.

SEC. 23. Any person who, by himself or by his servant or agent, or as the servant or agent of another person, shall offer or expose for sale, sell, use in the buying or selling of any commodity or thing or for hire or award, or retain in his possession a false weight or measure or weighing or measuring device, or any weight or measure or weighing or measuring device which has not been sealed by the State superintendent (commissioner) or his deputy, or inspectors at his direction within one year; or shall dispose of any condemned weight, measure, or weighing or measuring device contrary to law, or remove any tag placed thereon by the State superintendent (commissioner), or his deputy, or inspectors at his direction; or who shall sell or offer or expose for sale less than the quantity he represents, or shall take or attempt to take more than the quantity he represents, when, as the buyer, he furnishes the weight, measure, or weighing or measuring device by means of which the amount of commodity is determined; or who shall keep for the purpose of sale, offer or expose for sale, or sell any commodity in a manner contrary to law; or who shall violate any provision of this act for which a specific penalty has not been provided, or who shall sell or offer for sale, or use or have in his possession for the purpose of selling or using any device or instrument to be used to or calculated to falsify any weight or measure; shall be guilty of a misdemeanor, and shall be punished by a fine of not less than $20 or more than $200, or by imprisonment for not more than three months, or by both such fine and imprisonment, upon a first conviction in any court of competent jurisdiction; and upon a second or subsequent conviction in any court of competent jurisdiction, he shall be punished by a fine of not less than $50 or more than $500, or by imprisonment in the county jail for not more than one year, or by both such fine and imprisonment.

SEC. 24. The word "person," as used in this act, shall be construed to import both the plural and singular, as the case demands, and shall include corporations, companies, societies, and associations.

The words "weights, measures, or (and) weighing or (and) measuring devices," as used in this act, shall be construed to include all weights, scales, beams, measures of every kind, instruments and mechanical devices for weighing or measuring, and any appliances and accessories connected with any or all such instruments.

The words "sell" or "sale," as used in this act, shall be construed to include barter and exchange.

FORM NO. 2.

SECTION 1. The weights and measures received from the United States under a resolution of Congress approved June 14, 1836, and such new weights and measures as shall be received from the United States as standard weights and measures in addition thereto or in renewal thereof, and such as shall be supplied by the State in conformity therewith and certified by the National Bureau of Standards shall be the State standards of weights and measures.

SEC. 2. In addition to the State standards of weights and measures, provided for above, there shall be supplied by the State at least one complete set of copies of these, to be kept at all times in the office of the State superintendent (commissioner), and to be known as office standards; and such other weights, measures, and apparatus as may be found necessary to carry out the provisions of this act, to be known as working standards. Such weights, measures, and apparatus shall be verified by the State superintendent (commissioner), or his deputy or inspectors, at his direction, upon their

initial receipt and at least once in each year thereafter, the office standards by direct comparison with the State standards, the working standards by comparison with the office standards. When found accurate upon these tests the office and working standards shall be sealed by stamping on them the letter "—" and the last two figures of the year with seals which the State superintendent (commissioner) shall have and keep for that purpose. The office standards shall be used in making all comparisons of weights, measures, and weighing or measuring devices submitted for test in the office of the superintendent (commissioner) and the State standards shall be used only in verifying the office standards and for scientific purposes.

SEC. 3. There shall be a State superintendent (commissioner) of weights and measures, who shall be appointed by the governor, by and with the advice and consent of the senate. Such superintendent (commissioner) shall be appointed for a term of five years, and shall receive a salary of $——— a year. There shall be a deputy superintendent (commissioner) of weights and measures and inspectors of weights and measures, the deputy to be appointed by the superintendent of weights and measures and to hold office during the superintendent's (commissioner's) term of office, the inspectors to be appointed from an eligible list prepared by the civil service board and under the rules of said board. The superintendent (commissioner) of weights and measures shall be allowed for salaries for the deputy superintendent (commissioner) of weights and measures, inspectors of weights and measures, clerical services, traveling and contingent expenses for himself, his deputy, and inspectors such sums as shall be appropriated by the legislature.

SEC. 4. The State superintendent (commissioner) of weights and measures shall forthwith, on his appointment, give a bond in the penal sum of $5,000, with sureties, to be approved by the secretary of State (attorney general) for the faithful performance of the duties of his office and for the safekeeping of the standards intrusted to his care and for the surrender thereof immediately to his successor in office or to the person appointed by the governor to receive them. The deputy superintendent (commissioner) of weights and measures and each inspector of weights and measures shall forthwith upon his appointment give a bond in the penal sum of $1,000, with sureties, to be approved by the secretary of State (attorney general), for the faithful performance of the duties of his office and for the safekeeping of any apparatus intrusted to his care.

SEC. 5. The superintendent (commissioner) of weights and measures shall take charge of the standards adopted by this act as the standards of the State, and cause them to be kept in a fireproof building belonging to the State (or in a safe and suitable place in the office of the superintendent (commissioner), from which they shall not be removed except for repairs or for certification, and he shall take all other necessary precautions for their safekeeping. He shall maintain the State standards in good order and shall submit them at least once in ten years to the National Bureau of Standards for certification. He shall keep a complete record of the standards, balances, and other apparatus belonging to the State and take a receipt for same from his successor in office. He shall annually, on the first day of ———, make to the governor a report of all work done by his office.

SEC. 6. The superintendent (commissioner) of weights and measures, or his deputy, or inspectors, at his direction, shall at least once in five years try and prove by the office standards all standard weights, measures, and other apparatus which may belong to any county or city, required to appoint a sealer and purchase and keep standards of weights and measures by the provisions of this Act, and shall seal such when found to be accurate by stamping on them the letter "—" and the last two figures of the year with seals which he shall have and keep for that purpose.

The State superintendent (commissioner), or his deputy, or inspectors, at his direction, shall inspect all standard weights, measures, and other apparatus used by such counties and cities at least once in two years, and shall keep a record of the same. He, or his deputy, or inspectors, at his direction, shall at least once in two years visit these cities and counties for the purpose and in order to inspect the work of the local sealers, and in the performance of such duties they may inspect the weights, measures, balances, or any other weighing or measuring devices of any citizen, firm, or corporation, and shall have the same powers as the local sealer of weights and measures. The superintendent shall issue from time to time regulations for the guidance of county and city sealers, and the said regulations shall govern the procedure to be followed by the aforesaid officers in the discharge of their duties.

SEC. 7. The State superintendent (commissioner) of weights and measures, shall have and keep a general supervision of the weights and measures, and weighing or

measuring devices offered for sale, sold, or in use in the State. He, or his deputy, or inspectors, at his direction, shall, upon the written request of any citizen, firm, or corporation, or educational institution in the State, test or calibrate weights, measures and weighing or measuring devices used as standards in the State. He, or his deputy, or inspectors, at his direction shall at least once annually test all scales, weights, and measures used in checking the receipts or disbursements of supplies in every institution for the maintenance of which moneys are appropriated by the legislature, and he shall report in writing his findings to the supervisory board and to the executive officer of the institution concerned, and, at the request of such board or executive officer, the superintendent (commissioner) of weights and measures shall appoint in writing one or more employees then in the actual service of the institution who shall act as special deputies for the purpose of checking the receipts or disbursements of supplies.

SEC. 8. When not otherwise provided by law the State superintendent (commissioner) shall have the power, and it shall be his duty, in those parts of the State in which a city or county sealer is not required to be appointed by the provisions of this act, to inspect, test, try, and ascertain if they are correct all weights, measures, and weighing or measuring devices kept, offered, or exposed for sale, sold, or used or employed by any proprietor, agent, lessee, or employee in proving the size, quantity, extent, area, or measurement of quantities, things, produce, or articles for distribution or consumption purchased or offered or submitted by such person or persons for sale, hire, or award; and he shall have the power to and shall from time to time weigh or measure and inspect packages or amounts of commodities of whatsoever kind kept for the purpose of sale, offered or exposed for sale, or sold or in the process of delivery, in order to determine whether the same contains the amounts represented, and whether they be offered for sale or sold in a manner in accordance with law. He shall at least twice each year and as much oftener as he may deem necessary see that all weights, measures, and weighing or measuring devices used are correct. He may for the purpose above mentioned, and in the general performance of his official duties, enter and go into or upon, and without formal warrant, any stand, place, building, or premises, or stop any dealer whatsoever, and require him, if necessary, to proceed to some place which the State superintendent (commissioner) may specify, for the purpose of making the proper tests. Whenever the State superintendent (commissioner) finds a violation of the statutes relating to weights and measures, he shall cause the violator to be prosecuted.

SEC. 9. Whenever the State superintendent (commissioner) compares weights, measures, or weighing or measuring instruments and finds that they correspond or causes them to correspond with the standards in his possession, he shall seal or mark such weights, measures, or weighing or measuring instruments with appropriate devices.

SEC. 10. The State superintendent (commissioner) shall condemn and seize and may destroy incorrect weights, measures, or weighing or measuring devices which, in his best judgment, are not susceptible of satisfactory repair; but such as are incorrect and yet may be repaired, he shall mark or tag as "Condemned for repairs." The owner or users of any weights, measures, or weighing or measuring devices of which such disposition is made shall have the same repaired or corrected within ten days, and they may neither use nor dispose of the same in any way, but shall hold the same at the disposal of the superintendent (commissioner). Any weights, measures, or weighing or measuring devices which have been "condemned for repairs," and have not been repaired as required above, shall be confiscated by the superintendent (commissioner).

SEC. 11. The powers and duties given to and imposed upon the State superintendent (commissioner) of weights and measures by sections eight, nine, and ten are hereby given to and imposed upon his deputy and inspectors also, when acting under his instructions and at his direction.

SEC. 12. There shall be a county sealer of weights and measures in each county having a population of twenty thousand or more inhabitants, exclusive of any city having a population of twenty-five thousand or more inhabitants situated therein, according to the last official State or United States census, who shall be appointed by the board of county commissioners for a term of five years. He shall be paid a salary determined by such board, said salary not to be less than $1,000 a year, and no fee shall be charged by him or by the county for the inspection, testing, or sealing or the repairing or adjusting of weights, measures, or weighing or measuring devices. Whenever the board of county commissioners of such a county shall deem it necessary,

they may appoint and fix the salary of one or more deputy sealers of weights and measures. Such deputy or deputies, when not appointed merely for some temporary purpose, shall hold office for a term of five years from the date of their appointment, and all deputies appointed shall have the same powers and may perform the same duties as the county sealer, when acting under his instructions and at his direction.

SEC. 13. There shall be a city sealer of weights and measures in cities of not less than twenty-five thousand population, according to the latest official State or United States census, to be appointed by the mayor from a list to be furnished by the civil-service board and under the rules of such board where such board exists; otherwise he shall be appointed by the mayor, by and with the advice and consent of the common council for a term of five years. He shall be paid a salary to be determined by the common council, said salary not to be less than $1,000 a year, and no fee shall be charged by him or by the city for the inspecting, testing, or sealing, or the repairing or adjusting of weights, measures, or weighing or measuring devices. Whenever the mayor and common council shall deem it necessary, one or more deputy sealers of weights and measures may be appointed and their salary fixed as above, who, when not appointed merely for some temporary purpose, shall hold office for a term of five years from the date of their appointment. All deputies appointed shall have the same powers and may perform the same duties as the city sealer, when acting under his instructions and at his direction. In those cities in which no sealer is required by the above, the county sealer of the county, if such an officer is required to be appointed by the provisions of this act, shall perform in said cities the duties and have like powers as in the county.

SEC. 14. Nothing in sections twelve and thirteen of this act shall be construed to prevent two or more counties or a county and a city situated therein, each of which are required to appoint sealers under the provisions of this act, from combining the whole or any part of their districts, as may be agreed upon by the boards of county commissioners of the counties, or such board of the county and the mayor and common council of the city with one set of standards and one sealer, upon the written consent of the State superintendent (commissioner) of weights and measures. A sealer appointed in pursuance of an agreement for such combination shall, subject to the terms of his appointment, have the same authority, jurisdiction, and duties as if he had been appointed by each of the authorities who are parties to the agreement.

SEC. 15. The county or city sealer of weights and measures shall forthwith, on his appointment, give a bond in the penal sum of $1,000, with sureties, to be approved by the appointing power, for the faithful performance of the duties of his office.

SEC. 16. The board of county commissioners of each county and the common council of each city required to appoint a sealer under the provisions of this act shall procure at the expense of the county or city, and shall keep at all times a set of weights and measures and other apparatus as complete and of such materials and construction as the said superintendent (commissioner) of weights and measures may direct. All such weights, measures, and other apparatus having been tried and accurately proven by the State superintendent (commissioner) shall be sealed and certified to by him as hereinbefore provided, and shall be then deposited with and preserved by the county or city sealer as public standards for each county or city.

Whenever the board of county commissioners of such county or the common council of such city shall neglect for six months so to do, the county auditor of said county, or the city clerk (comptroller) of said city, on notification and request by the superintendent (commissioner) of weights and measures, shall provide such standards and cause the same to be tried, sealed, and deposited at the expense of the county or city.

SEC. 17. Where not otherwise provided by law, the county or city sealer shall have the same powers and shall perform the same duties within his county or city as are granted to and imposed upon the State superintendent (commissioner) of weights and measures by sections eight, nine, and ten of this act.

SEC. 18. The county or city sealer shall keep a complete record of all of his official acts, and shall make an annual report, duly sworn to, on the first day of ———, to the State superintendent (commissioner) of weights and measures, on blanks furnished by the latter; and also, any special reports that the latter may request.

SEC. 19. The superintendent (commissioner) of weights and measures, his deputy, and inspectors, and the county and city sealers and deputy sealers of weights and measures, are hereby made special policemen and are authorized and empowered to arrest, without formal warrant, any violator of the statutes in relation to weights and measures, and to seize for use as evidence, without formal warrant, any false or unsealed

weight, measure, or weighing or measuring device or package or amount of commodity found to be used, retained, or offered or exposed for sale or sold in violation of law.

SEC. 20. Any person who shall hinder or obstruct in any way the superintendent (commissioner) of weights and measures, his deputy, or inspectors, or any county or city sealer or deputy sealer of weights and measures, in the performance of his official duties shall be guilty of a misdemeanor, and, upon conviction thereof in any court of competent jurisdiction, shall be punished by a fine of not less than $20 or more than $200, or by imprisonment in the county jail for not more than three months, or by both such fine and imprisonment.

SEC. 21. Any person who shall impersonate in any way the superintendent (commissioner) of weights and measures, his deputy, or inspectors, or any county or city sealer or deputy sealer of weights and measures, by the use of his seal or counterfeit of his seal, or otherwise, shall be guilty of a misdemeanor, and, upon conviction thereof in any court of competent jurisdiction, shall be punished by a fine of not less than $100 nor more than $500, or by imprisonment for not more than one year, or by both such fine and imprisonment.

SEC. 22. It shall be unlawful to sell or offer to sell any coal, coke, or charcoal in any other manner than by weight. It shall be unlawful for any person to deliver any coal, coke, or charcoal without each such delivery being accompanied by a delivery ticket and a duplicate thereof, on each of which shall be in ink or other indelible substance, distinctly expressed in pounds, the gross weight of the load, the tare of the delivery vehicle, and the quantity or quantities of coal, coke, or charcoal contained in the vehicle used in such deliveries, with the name of the purchaser thereof, and the name of the dealer from whom purchased. One of these tickets shall be surrendered to the State superintendent (commissioner), his deputy, or inspectors, or a county or city sealer or deputy sealer of weights and measures, upon his demand for his inspection, and this ticket or a weight slip issued by him when he desires to retain the original shall be delivered to the said purchaser of said coal, coke, or charcoal, or his agent or representative at the time of the delivery of the fuel; and the other ticket shall be retained by the seller of the fuel. When the buyer carries away the purchase, a delivery ticket showing the actual number of pounds delivered to him must be given to him at the time the sale is made.

SEC. 23. It shall be unlawful to keep for the purpose of sale, offer or expose for sale, or sell, any commodity in package form unless the net quantity of the contents be plainly and conspicuously marked on the outside of the package, in terms of weight, measure, or numerical count: *Provided, however*, That reasonable variations or tolerances shall be permitted, and that these reasonable variations or tolerances and also exemptions as to small packages shall be established by rules and regulations made by the superintendent (commissioner) of weights and measures: *And provided, further*, That this section shall not be construed to apply to those commodities in package form, the manner of sale of which is specifically regulated by the provisions of other sections of this act.

The word "package" as used in this section shall be construed to include the package, carton, case, can, box, barrel, bottle, phial, or other receptacle put up by the manufacturer; or, when put up prior to the order of the commodity, by the vendor, which may be labeled, branded, or stenciled or otherwise marked, or which may be suitable for labeling, branding, or stenciling, or marking otherwise, making one complete package of the commodity. The word "package" shall be construed to include both the wholesale and the retail package.

SEC. 24. It shall be unlawful to keep for the purpose of sale, offer or expose for sale, or sell, any commodity composed in whole or in part of cotton, wool, linen, or silk, or any other textile material on a spool or similar holder, or in a container or band, or in a bolt or roll, or in a ball, coil, or skein, or in any similar manner, unless the net amount of the commodity in terms of weight or measure shall be definitely, plainly, and conspicuously marked on the principal label, if there be such a label; otherwise on a wrapping, band, or tag attached thereto.

The words "spool or similar holder, container or band, bolt or roll, or ball, coil, or skein" shall be construed to include the spool or similar holder, container or band, bolt or roll, or ball, coil, or skein put up by the manufacturer; or when put up prior to the order of the commodity, by the vendor. It shall be held to include both the wholesale and the retail package.

SEC. 25. It shall be unlawful for any person to sell, or offer to sell, any butter or renovated or process butter or oleomargarine in any other manner than by weight. It shall be unlawful for any person to put up, pack, or keep for the purpose of sale,

offer or expose for sale, or sell any butter or renovated or process butter, or oleomargarine in the form of prints, bricks, or rolls in any other than the following sizes, to wit, one-quarter pound, one-half pound, one pound, one and one-half pounds, or multiples of one pound. Each print, brick, or roll shall bear a definite, plain, and conspicuous statement of its true net weight, on the principal label, where there be such a label, otherwise on the outside wrapper thereof; such statement shall be in Gothic type not less than one-quarter inch square.

The prints, bricks, or rolls referred to in this section shall be construed to include those prints, bricks, or rolls put up by the manufacturer or producer; or when put up prior to the order of the commodity, by the vendor.

SEC. 26. All bread kept for the purpose of sale, offered or exposed for sale, or sold, shall be sold by weight. To each loaf of bread shall be attached a label plainly showing its correct weight and the firm name of the manufacturer thereof, the size of the label and type to be used to be specified by the State superintendent (commissioner) of weights and measures. It shall be unlawful for any person to make or keep for the purpose of sale, offer or expose for sale, or sell, any bread other than such as shall be in accordance with the provisions of this section.

SEC. 27. Bottles used for the sale of milk or cream shall be of the capacity of one-half gallon, three pints, one quart, one pint, one-half pint, and one gill, filled full to the bottom of the lip. The following variations on individual bottles or jars may be allowed, but the average content of not less than twenty-five bottles selected at random from at least four times the number tested must not be in error by more than one-quarter of these tolerances: Six drams above and six drams below on the half gallon, five drams above and five drams below on the three-pint, four drams above and four drams below on the quart, three drams above and three drams below on the pint, two drams above and two drams below on the half-pint, and two drams above and two drams below on the gill. Bottles or jars used for the sale of milk or cream shall have clearly blown or otherwise permanently marked in the side of the bottle the capacity of the bottle and the word "Sealed;" and in the side or bottom of the bottle the name, initials, or trade-mark of the manufacturer and a designating number, which designating number shall be different for each manufacturer and may be used in indentifying the bottles. The designating number shall be furnished by the State superintendent (commissioner) of weights and measures upon application by the manufacturer, and upon the filing by the manufacturer of a bond in the sum of $1,000, with sureties to be approved by the secretary of state (attorney general) conditioned upon their conformance with the requirements of this section. A record of the bonds furnished and the designating numbers and to whom furnished shall be kept in the office of the superintendent (commissioner) of weights and measures.

Any manufacturer who sells or offers to sell milk or cream bottles to be used in this State that do not comply as to size and markings with the provisions of this section shall suffer a penalty of $500, to be recovered by the attorney general in an action against the offender's bondsmen to be brought in the name of the people of the State. Any dealer who uses, for the purpose of selling milk or cream, jars or bottles purchased after this law takes effect that do not comply with the requirements of this section as to markings and capacity shall be deemed guilty of using a false or insufficient measure.

Sealers of weights and measures are not required to seal bottles or jars for milk or cream marked as in this section provided, but they shall have the power to and shall from time to time make tests on individual bottles used by the various firms in the territory over which they have jurisdiction in order to ascertain if the above provisions are being complied with, and they shall immediately report violations found to the State superintendent (commissioner) of weights and measures.

SEC. 28. The standard barrel for fruits, vegetables, and produce shall be of the following dimensions when measured without distension of its parts: Diameter of head inside of staves, seventeen and one-eighth inches; distance between heads, inside measurement, twenty-six inches; the outside bilge or circumference not less than sixty-four inches; and the thickness of staves not more than four-tenths of an inch: *Provided*, That any barrel of a different form having the same distance between heads and a capacity of seven thousand and fifty-six cubic inches shall be a standard barrel. It shall be unlawful for any person to offer or expose for sale or sell any other barrels for fruits, vegetables, or produce, or any fruits, vegetables, or produce in other barrels than the standard barrel as defined in this section.

SEC. 29. It shall be unlawful to sell or offer to sell any berries or small fruits in any other manner than by weight, dry measure, or in the containers described in this section. It shall be unlawful to procure or keep for the purpose of sale, offer or ex-

pose for sale, sell, or give away baskets or other open containers for berries or small fruits, holding one quart or less, or to procure or keep for the purpose of sale, offer or expose for sale, or sell berries or small fruits in baskets or other open containers, holding one quart or less, of any other than the following capacities, when level full: One quart, one pint, or one-half pint, standard dry measure.

SEC. 30. Whenever any commodity is sold on a basis of weight, it shall be unlawful to employ any other weight in such sale than the net weight of the commodity; and all contracts concerning goods sold on a basis of weight shall be understood and construed accordingly. Whenever the weight of a commodity is mentioned in this act, it shall be understood and construed to mean the net weight of the commodity.

SEC. 31. Any person who, by himself or by his servant or agent, or as the servant or agent of another person, shall offer or expose for sale, sell, use in the buying or selling of any commodity or thing or for hire or award, or retain in his possession a false weight or measure or weighing or measuring device which has not been sealed by the State superintendent (commissioner), or his deputy, or inspectors, or by a sealer or deputy sealer of weights and measures within one year, or shall dispose of any condemned weight, measure, or weighing or measuring device contrary to law, or remove any tag placed thereon by the State superintendent (commissioner), or his deputy, or inspectors, or by a sealer or deputy sealer of weights and measures; or who shall sell or offer or expose for sale less than the quantity he represents, or shall take or attempt to take more than the quantity he represents, when, as the buyer, he furnishes the weight, measure, or weighing or measuring device by means of which the amount of commodity is determined; or who shall keep for the purpose of sale, offer or expose for sale, or sell any commodity in a manner contrary to law; or who shall violate any provision of this act for which a specific penalty has not been provided; or who shall sell or offer for sale, or use or have in his possession for the purpose of selling or using any device or instrument to be used to or calculated to falsify any weight or measure shall be guilty of a misdemeanor, and shall be punished by a fine of not less than $20 or more than $200, or by imprisonment for not more than three months, or by both such fine and imprisonment, upon a first conviction in any court of competent jurisdiction; and upon a second or subsequent conviction in any court of competent jurisdiction he shall be punished by a fine of not less than $50 or more than $500, or by imprisonment in the county jail for not more than one year, or by both such fine and imprisonment.

SEC. 32. The word "person" as used in this act shall be construed to import both the plural and singular, as the case demands, and shall include corporations, companies, societies, and associations.

The words "weights, measures, or (and) weighing or (and) measuring devices," as used in this act, shall be construed to include all weights, scales, beams, measures of every kind, instruments and mechanical devices for weighing or measuring, and any appliances and accessories connected with any or all such instruments.

The words "sell" or "sale" as used in this act, shall be construed to include barter and exchange.

FORM NO. 3.

SECTION 1. The weights and measures received from the United States under a resolution of Congress approved June 14, 1836, and such new weights and measures as shall be received from the United States as standard weights and measures in addition thereto or in renewal thereof, and such as shall be supplied by the State in conformity therewith and certified by the National Bureau of Standards, shall be the State standards of weights and measures.

SEC. 2. In addition to the State standards of weights and measures, provided for above, there shall be supplied by the State at least one complete set of copies of these, to be kept at all times in the office of the State superintendent (commissioner) and to be known as office standards; and such other weights, measures, and apparatus as may be found necessary to carry out the provisions of this act, to be known as working standards. Such weights, measures, and apparatus shall be verified by the State superintendent (commissioner) or his deputy, or inspectors, at his direction, upon their initial receipt and at least once in each year thereafter, the office standards by direct comparison with the State standards, the working standards by comparison with the office standards. When found accurate upon these tests the office and working standards shall be sealed by stamping on them the letter "—" and the last two figures of the year with seals which the State superintendent (commissioner) shall have and keep for that purpose. The office standards shall be used in making all

comparisons of weights, measures, and weighing and measuring devices submitted for test in the office of the superintendent (commissioner) and the State standards shall be used only in verifying the office standards and for scientific purposes.

SEC. 3. There shall be a State superintendent (commissioner) of weights and measures, who shall be appointed by the governor, by and with the advice and consent of the senate. Such superintendent (commissioner) shall be appointed for a term of five years, and shall receive a salary of $——— a year. There shall be a deputy superintendent (commissioner) of weights and measures and inspectors of weights and measures, the deputy to be appointed by the superintendent (commissioner) of weights and measures and to hold office during the superintendent's (commissioner's) term of office; the inspectors to be appointed from an eligible list prepared by the civil-service board and under the rules of said board. The superintendent (commissioner) of weights and measures shall be allowed for salaries for the deputy superintendent (commissioner) of weights and measures, inspectors of weights and measures, clerical services, traveling and contingent expenses for himself, his deputy, and inspectors such sums as shall be appropriated by the legislature.

SEC. 4. The State superintendent (commissioner) of weights and measures shall forthwith, on his appointment, give a bond in the penal sum of $5,000, with sureties, to be approved by the secretary of state (attorney general) for the faithful performance of the duties of his office and for the safe-keeping of the standards intrusted to his care and for the surrender thereof immediately to his successor in office or to the person appointed by the governor to receive them. The deputy superintendent (commissioner) of weights and measures and each inspector of weights and measures shall forthwith upon his appointment give a bond in the penal sum of $1,000, with sureties, to be approved by the secretary of state (attorney general), for the faithful performance of the duties of his office and for the safe-keeping of any apparatus intrusted to his care.

SEC. 5. The superintendent (commissioner) of weights and measures shall take charge of the standards adopted by this act as standards of the State, and cause them to be kept in a fireproof building belonging to the State (or in a safe and suitable place in the office of the superintendent (commissioner)), from which they shall not be removed except for repairs or for certification, and he shall submit them at least once in ten years to the National Bureau of Standards for certification. He shall keep a complete record of the standards, balances, and other apparatus belonging to the State and take a receipt for the same from his successor in office. He shall annually, on the first day of ———, make to the governor a report of all work done by his office.

SEC. 6. The State superintendent (commissioner) of weights and measures, or his deputy, or inspectors, at his direction, shall at least once in five years try and prove by the office standards all standard weights, measures, and other apparatus which may belong to any county or city, and shall seal such when found to be accurate by stamping on them the letter "—" and the last two figures of the year with seals which he shall have and keep for that purpose.

The State superintendent (commissioner), or his deputy, or inspectors, at his direction, shall inspect all standard weights, measures, and other apparatus used by the counties and cities at least once in two years, and shall keep a record of the same. He, or his deputy, or inspectors, at his direction, shall at least once in two years visit the various cities and counties of the State for this purpose and in order to inspect the work of the local sealers, and in the performance of such duties they shall have the same powers as the local sealer of weights and measures. The superintendent (commissioner) shall issue from time to time regulations for the guidance of county and city sealers, and the said regulations shall govern the procedure to be followed by the aforesaid officers in the discharge of their duties.

SEC. 7. The State superintendent (commissioner) of weights and measures shall have and keep a general supervision of the weights, measures, and weighing or measuring devices offered for sale, sold, or in use in the State. He, or his deputy, or inspectors, at his direction, shall, upon the written request of any citizen, firm, corporation, or educational institution in the State, test or calibrate weights, measures, and weighing or measuring devices, used as standards in the State. He, or his deputy, or inspectors, at his direction, shall at least once annually test all scales, weights, and measures used in checking the receipts or disbursements of supplies in every institution for the maintenance of which moneys are appropriated by the legislature, and he shall report in writing his findings to the supervisory board and to the executive officer of the institution concerned, and, at the request of such board, or executive officer, the superintendent (commissioner) of weights and measures shall appoint

in writing one or more employees then in the actual service of the institution who shall act as special deputies for the purpose of checking the receipts or disbursements of supplies.

SEC. 8. There shall be a county sealer of weights and measures in each county, who shall be appointed by the board of county commissioners for a term of five years. He shall be paid a salary determined by such board, said salary not to be less than $1,000 a year, and no fee shall be charged by him or by the county for the inspecting, testing, or sealing, or the repairing or adjusting of weights, measures, or weighing or measuring devices. Whenever the board of county commissioners shall deem it necessary they may appoint and fix the salary of one or more deputy sealers of weights and measures. Such deputy or deputies, when not appointed merely for some temporary purpose, shall hold office for a term of five years from the date of their appointment, and all deputies appointed shall have the same powers and may perform the same duties as the county sealer when acting under his instructions and at his direction.

SEC. 9. There shall be a city sealer of weights and measures in cities of not less than twenty-five thousand population, according to the latest official State or United States census, to be appointed by the mayor from a list to be furnished by the civil service board and under the rules of such board where such board exists; otherwise he shall be appointed by the mayor, by and with the advice and consent of the common council, for a term of five years. He shall be paid a salary to be determined by the common council, said salary not to be less than $1,000 a year, and no fee shall be charged by him or by the city for the inspecting, testing or sealing, or repairing or adjusting of weights, measures or weighing or measuring devices. Whenever the mayor and common council shall deem it necessary, one or more deputy sealers of weights and measures may be appointed and their salary fixed as above, who, when not appointed merely for some temporary purpose, shall hold office for a term of five years from the date of their appointment. All deputies appointed shall have the same powers and may perform the same duties as the city sealer when acting under his instructions and at his direction.

In those cities in which no sealer is required by the above the county sealer of the county shall perform in the said cities the duties and have like powers as in the county.

SEC. 10. Nothing in sections eight and nine of this act shall be construed to prevent two or more counties, or a county and a city situated therein, from combining the whole or any part of their districts, as may be agreed upon by the boards of county commissioners of the counties, or such board of the county and the mayor and common council of the city, with one set of standards and one sealer, upon the written consent of the State superintendent (commissioner) of weights and measures. A sealer appointed in pursuance of an agreement for such combination shall, subject to the terms of his appointment, have the same authority, jurisdiction, and duties as if he had been appointed by each of the authorities who are parties to the agreement.

SEC. 11. The county or city sealer of weights and measures shall forthwith, on his appointment, give a bond in the penal sum of $1,000, with sureties, to be approved by the appointing power, for the faithful performance of the duties of his office.

SEC. 12. The board of county commissioners of each county and the common council of each city required to appoint a sealer under the provisions of this act shall procure at the expense of the county or city, and shall keep at all times a set of weights and measures and other apparatus, as complete and of such materials and construction as the State superintendent (commissioner) of weights and measures may direct. All such weights, measures, and other apparatus having been tried and accurately proven by the State superintendent (commissioner) shall be sealed and certified to by him as hereinbefore provided, and shall be then deposited with and preserved by the county or city sealer as public standards for each county or city.

Whenever the board of county commissioners of a county or the common council of such city shall neglect for six months so to do, the county auditor of the county, or the city clerk (comptroller) of said city, on notification and request by the superintendent (commissioner) of weights and measures, shall provide such standards and cause the same to be tried, sealed, and deposited at the expense of the county or city.

SEC. 13. When not otherwise provided by law the county or city sealer shall have the power and it shall be his duty within his county or city to inspect, test, try, and ascertain if they are correct all weights, measures, and weighing or measuring devices kept, offered, or exposed for sale, sold, or used or employed within the county or city by any proprietor, agent, lessee, or employee in proving the size, quantity, extent,

area, or measurement of quantities, things, produce, or articles for distribution or consumption purchased or offered or submitted by such person or persons for sale, hire, or award; and he shall have the power to and shall from time to time weigh or measure and inspect packages or amounts of commodities of whatsoever kind kept for the purpose of sale, offered or exposed for sale, or sold or in the process of delivery, in order to determine whether the same contain the amounts represented, and whether they be kept, offered or exposed for sale or sold in a manner in accordance with law; he shall at least twice each year and as much oftener as he may deem necessary see that all weights, measures, and weighing or measuring devices used in the county or city are correct. He may for the purpose above mentioned, and in the general performance of his official duties, enter and go into or upon, and without formal warrant, any stand, place, building, or premises, or stop any person whomsoever, and require him, if necessary, to proceed to some place which the sealer may specify, for the purpose of making the proper tests. Whenever the county or city sealer finds a violation of the statutes relating to weights and measures, he shall cause the violator to be prosecuted.

SEC. 14. Whenever the county or city sealer compares weights, measures, or weighing or measuring devices and finds that they correspond or causes them to correspond with the standards in his possession, he shall seal or mark such weights, measures, or weighing or measuring devices with appropriate devices to be approved by the State superintendent (commissioner) of weights and measures.

SEC. 15. The county or city sealer shall condemn and seize and may destroy incorrect weights, measures, or weighing or measuring devices which, in his best judgment, are not susceptible of satisfactory repair; but such as are incorrect and yet may be repaired, he shall mark or tag as "Condemned for repairs" in a manner prescribed by the State superintendent (commissioner) of weights and measures. The owners or users of any weights, measures, or weighing or measuring devices of which such disposition is made, shall have the same repaired or corrected within 10 days, and they may neither use nor dispose of the same in any way, but shall hold the same at the disposal of the sealer. Any weights, measures, or weighing or measuring devices which has been "Condemned for repairs," and have not been repaired as required above, shall be confiscated by the sealer.

SEC. 16. The county or city sealer shall keep a complete record of all of his official acts, and shall make an annual report to the board of county commissioners of the county or the mayor and common council of the city, and an annual report, duly sworn to, on the 1st day of ———, to the State superintendent (commissioner) of weights and measures, on blanks to be furnished by the latter; and also any special reports that the latter may request.

SEC. 17. The superintendent (commissioner) of weights and measures, his deputy and inspectors, and the county and city sealers and deputy sealers of weights and measures, are hereby made special policemen, and are authorized and empowered to arrest, without formal warrant, any violator of the statutes in relation to weights and measures, and to seize for use as evidence, without formal warrant, any false or unsealed weight, measure, or weighing or measuring device or package or amount of commodity found to be used, retained, or offered or exposed for sale or sold in violation of law.

SEC. 18. Any person who shall hinder or obstruct in any way the superintendent (commissioner) of weights and measures, his deputy, or inspectors, or any county or city sealer, or deputy sealer of weights and measures in the performance of his official duties shall be guilty of a misdemeanor, and, upon conviction thereof in any court of competent jurisdiction, shall be punished by a fine of not less than $20 or more than $200, or by imprisonment in the county jail for not more than three months, or by both such fine and imprisonment.

SEC. 19. Any person who shall impersonate in any way the superintendent (commissioner) of weights and measures, his deputy, or inspectors, or any county or city sealer, or deputy sealer of weights and measures, by use of his seal or counterfeit of his seal, or otherwise, shall be guilty of a misdemeanor, and upon conviction thereof in any court of competent jurisdiction shall be punished by a fine of not less than $100 nor more than $500, or by imprisonment for not more than one year, or by both such fine and imprisonment.

SEC. 20. It shall be unlawful to sell or offer to sell any coal, coke, or charcoal in any other manner than by weight. It shall be unlawful for any person to deliver any coal, coke, or charcoal without such delivery being accompanied by a delivery ticket and a duplicate thereof, on each of which shall be in ink or other indelible substance, distinctly expressed in pounds, the gross weight of the load, the tare of the delivery vehicle, and the quantity or quantities of coal, coke, or charcoal contained in the

vehicle used in such deliveries, with the name of the purchaser thereof, and the name of the dealer from whom purchased. One of these tickets shall be surrendered to the sealer or deputy sealer of weights and measures upon his demand for his inspection, and this ticket or a weight slip issued by him when he desires to retain the original shall be delivered to the said purchaser of said coal, coke, or charcoal, or his agent or representative at the time of the delivery of the fuel; and the other ticket shall be retained by the seller of the fuel. When the buyer carries away the purchase, a delivery ticket showing the actual number of pounds delivered to him must be given to him at the time the sale is made.

SEC. 21. It shall be unlawful to keep for the purpose of sale, offer or expose for sale, or sell any commodity in package form unless the net quantity of the contents be plainly and conspicuously marked on the outside of the package, in terms of weight, measure, or numerical count: *Provided, however,* That reasonable variations or tolerances shall be permitted, and that these reasonable variations or tolerances and also exemptions as to small packages shall be established by rules and regulations made by the superintendent (commissioner) of weights and measures: *and provided, further,* That this section shall not be construed to apply to those commodities in package form the manner of sale of which is specifically regulated by the provisions of other sections of this act.

The word "package" as used in this section shall be construed to include the package, carton, case, can, box, barrel, bottle, phial, or other receptacle put up by the manufacturer; or, when put up prior to the order of the commodity, by the vendor; which may be labeled, branded, or stenciled, or otherwise marked, or which may be suitable for labeling, branding, or stenciling, or marking otherwise, making one complete package of the commodity. The word "package" shall be construed to include both the wholesale and retail package.

SEC. 22. It shall be unlawful to keep for the purpose of sale, offer or expose for sale, or sell any commodity composed in whole or in part of cotton, wool, linen, or silk, or any other textile material on a spool or similar holder, or in a container or band, or in a bolt or roll, or in a ball, coil, or skein, or in any similar manner, unless the net amount of the commodity in terms of weight or measure shall be definitely, plainly, and conspicuously marked on the principal label, if there be such a label; otherwise on a wrapper, band, or tag attached thereto.

The words "spool or similar holder, container or band, bolt or roll, or ball, coil, or skein" shall be construed to include the spool or similar holder, container or band, bolt or roll, or ball, coil, or skein put up by the manufacturer; or, when put up prior to the order of the commodity, by the vendor. It shall be held to include both the wholesale and the retail package.

SEC. 23. It shall be unlawful for any person to sell or offer to sell any butter, or renovated or process butter, or oleomargarine in any other manner than by weight. It shall be unlawful for any person to put up, pack, or keep for the purpose of sale, offer or expose for sale, or sell any butter or renovated or process butter, or oleomargarine in the form of prints, bricks, or rolls in any other than the following sizes, to wit: One-quarter pound, one-half pound, one pound, one and one-half pounds, or multiples of one pound. Each print, brick, or roll shall bear a definite, plain, and conspicuous statement of its true net weight, on the principal label, where there be such label, otherwise on the outside wrapper thereof; such statement shall be in Gothic type not less than one-quarter inch square.

The prints, bricks, or rolls referred to in this section shall be construed to include those prints, bricks, or rolls put up by the manufacturer or producer; or, when put up prior to the order of the commodity, by the vendor.

SEC. 24. All bread kept for the purpose of sale, offered or exposed for sale, or sold, shall be sold by weight. To each loaf of bread shall be attached a label plainly showing its correct weight and the firm name of the manufacturer thereof, the size of the label and type to be used to be specified by the State superintendent (commissioner) of weights and measures. It shall be unlawful for any person to make or keep for the purpose of sale, offer or expose for sale, or sell any bread other than such as shall be in accordance with the provisions of this section.

SEC. 25. Bottles used for the sale of milk or cream shall be of the capacity of one-half gallon, three pints, one quart, one pint, one-half pint, and one gill, filled full to the bottom of the lip. The following variations on individual bottles or jars may be allowed, but the average content of not less than twenty-five bottles selected at random from at least four times the number tested must not be in error by more than one-

quarter of these tolerances: Six drams above and six drams below on the half-gallon; five drams above and five drams below on the three-pint; four drams above and four drams below on the quart; three drams above and three drams below on the pint; two drams above and two drams below on the half-pint; and two drams above and two drams below on the gill. Bottles or jars used for the sale of milk or cream shall have clearly blown or otherwise permanently marked in the side of the bottle the capacity of the bottle, and the word "Sealed"; and in the side or bottom of the bottle the name, initials, or trade-mark of the manufacturer and a designating number, which designating number shall be different for each manufacturer and may be used in identifying the bottles. The designating number shall be furnished by the State superintendent (commissioner) of weights and measures upon application by the manufacturer, and upon the filing by the manufacturer of a bond in the sum of $1,000 with sureties to be approved by the secretary of State (attorney general) conditioned upon their conformance with the requirements of this section. A record of the bonds furnished and the designating numbers and to whom furnished shall be kept in the office of the superintendent (commissioner) of weights and measures.

Any manufacturer who sells or offers to sell milk or cream bottles to be used in this State that do not comply as to size and markings with the provisions of this section shall suffer a penalty of $500, to be recovered by the attorney general in an action against the offender's bondsmen, to be brought in the name of the people of the State. Any dealer who uses, for the purpose of selling milk or cream, jars or bottles purchased after this law takes effect that do not comply with the requirements of this section as to markings and capacity shall be deemed guilty of using a false or insufficient measure.

Sealers of weights and measures are not required to seal bottles or jars for milk or cream marked as in this section provided, but they shall have the power to and shall from time to time make tests on individual bottles used by various firms in the territory over which they have jurisdiction in order to ascertain if the above provisions are being complied with, and they shall immediately report violations found to the State superintendent (commissioner) of weights and measures.

SEC. 26. The standard barrel for fruits, vegetables, and produce shall be of the following dimensions when measured without distension of its parts: Diameter of head inside of staves, seventeen and one-eighth inches; distance between heads, inside measurement, twenty-six inches; the outside bilge or circumference not less than sixty-four inches; and the thickness of staves not more than four-tenths of an inch: *Provided*, that any barrel of a different form having the same distance between heads and a capacity of seven thousand and fifty-six cubic inches shall be a standard barrel. It shall be unlawful for any person to offer or expose for sale or sell any other barrels for fruits, vegetables, or produce, or any fruits, vegetables, or produce in other barrels than the standard barrel as defined in this section.

SEC. 27. It shall be unlawful to sell or offer to sell any berries or small fruits in any other manner than by weight, dry measure, or in the containers described in this section. It shall be unlawful to procure or keep for the purpose of sale, offer or expose for sale, sell, or give away baskets or other open containers for berries or small fruits, holding one quart or less, or to procure or keep for the purpose of sale, offer or expose for sale, or sell berries or small fruits in baskets or other open containers, holding one quart or less, of any other than the following capacities, when level full: One quart, one pint, or one-half pint, standard dry measure.

SEC. 28. Whenever any commodity is sold on a basis of weight, it shall be unlawful to employ any other weight in such sale than the net weight of the commodity; and all contracts concerning goods sold on a basis of weight shall be understood and construed accordingly. Whenever the weight of a commodity is mentioned in this act, it shall be understood and construed to mean the net weight of the commodity.

SEC. 29. Any person who, by himself or by his servant or agent, or as the servant or agent of another person, shall offer or expose for sale, sell, use in the buying or selling of any commodity or thing or for hire or award, or retain in his possession a false weight or measure or weighing or measuring device, or any weight or measure or weighing or measuring device which has not been sealed by the State superintendent (commissioner), or his deputy, or inspectors, or by a sealer or deputy sealer of weights and measures within one year; or shall dispose of any condemned weight, measure, or weighing or measuring device contrary to law, or remove any tag placed thereon by the State superintendent (commissioner), or his deputy, or inspectors, or by a sealer or deputy sealer of weights and measures; or who shall sell or offer or expose for sale less than the quantity he represents, or shall take or attempt to take more than the quantity he represents, when, as the buyer, he furnishes the weight, measure, or weighing or measuring device by means of which the amount of commodity

is determined, or who shall keep for the purpose of sale, offer or expose for sale, or sell any commodity in a manner contrary to law; or who shall violate any provision of this act for which a specific penalty has not been provided; or who shall sell or offer for sale, or use or have in his possession for the purpose of selling or using any device or instrument to be used to, or calculated to, falsify any weight or measure, shall be guilty of a misdemeanor, and shall be punished by a fine of not less than $20 or more than $200, or by imprisonment for not more than three months, or by both such fine and imprisonment, upon a first conviction in any court of competent jurisdiction; and upon a second or subsequent conviction in any court of competent jurisdiction, he shall be punished by a fine of not less than $50 or more than $500, or by imprisonment in the county jail for not more than one year, or by both such fine and imprisonment.

SEC. 30. The word "person" as used in this act, shall be construed to import both singular and plural, as the case demands, and shall include corporations, companies, societies, and associations.

The words "weights, measures, or (and) weighing or (and) measuring devices" as used in this act, shall be construed to include all weights, scales, beams, measures of every kind, instruments and mechanical devices for weighing or measuring, and any appliance and accessories connected with any or all such instruments.

The words "sell" or "sale" as used in this act, shall be construed to include barter and exchange.

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